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Battelle Technical Review

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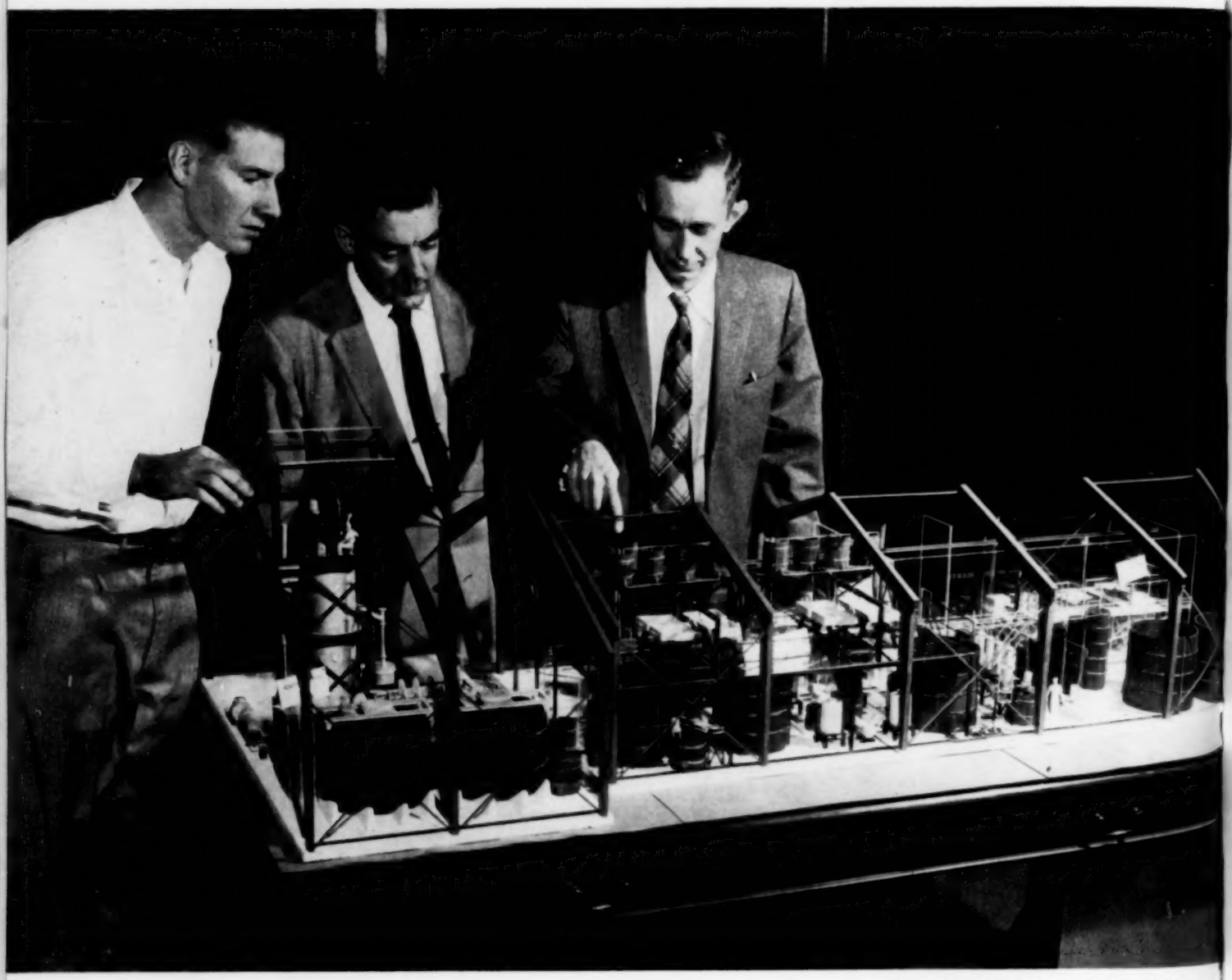
Water in Area Industrial Development

This scale model is a prototype of a pilot plant designed to evaluate the feasibility of a metal-recovery process. The model, one twenty-fourth the actual size of the projected pilot plant, is based upon studies carried on by Battelle. Scale models such as this facilitate preparation of engineering drawings, give three-dimensional perspective to construction personnel, and serve as training aids for those who are to operate plants. The pictured prototype was designed and built by members of Battelle's extractive metallurgy division.



PILOT-PLANT MODEL

Volume 6, Number 11
November 1957

BATTELLE TECHNICAL REVIEW

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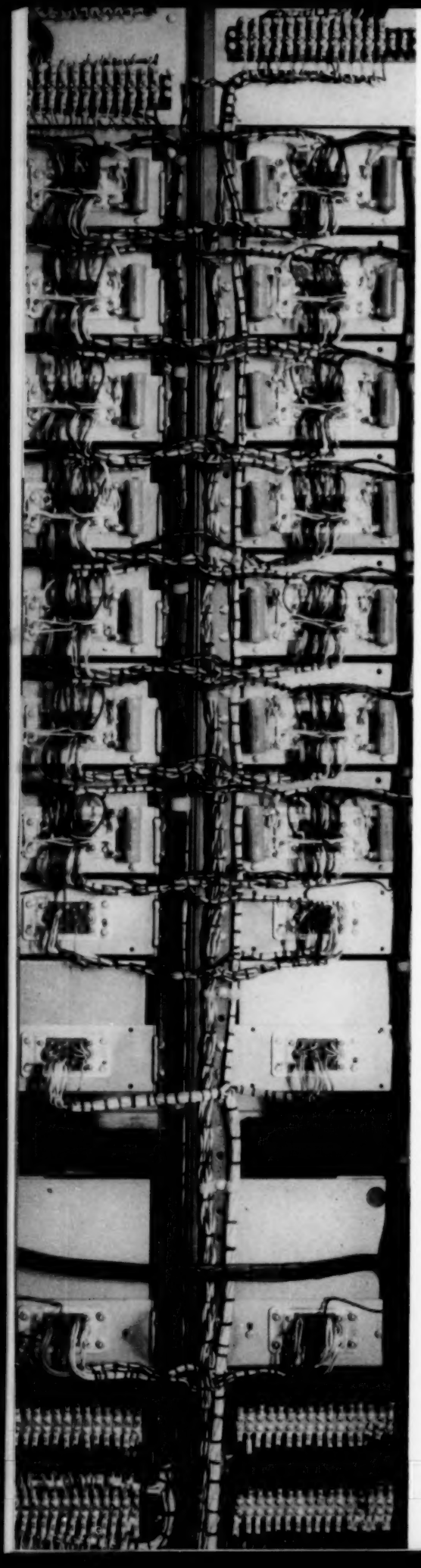

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Abstracts of articles and papers in a wide variety of technological fields from more than 1350 journals published throughout the world. Abstract selection largely reflects the primary areas of Battelle research.

Unexpected Benefits from Research

MANY OF THE scientific advances that affect us most intimately are coming in the form of serendipity—unsought benefits from governmental and industrial research . . .

"Penicillin was discovered by Sir Alexander Fleming through serendipity; Goodyear discovered the vulcanization process for rubber when he accidentally dropped rubber mixed with sulfur on a hot stove . . . Midgley discovered antiknock compounds for internal combustion engine fuels when he was forced to use iodine in an experiment because the laboratory stockroom was temporarily out of oil-soluble dyes . . .

"This year upwards of 5,000 laboratories in the United States are spending some $7 billion on scientific and technological research. More than 200,000 professional scientists, aided by perhaps several times this number of skilled technicians, are at work conducting thousands of experiments in every conceivable area of science. Thousands more technologists are adapting laboratory-found knowledge to use—and, in the very process, they are finding even more new knowledge. All this knowledge is being disseminated and integrated through the many technical and professional societies and organizations and through a growing flood of scientific publications. What should be the effects of all this effort on the direct results of the research, on the resulting serendipitous outcome—and, finally, on you the individual?

"It is obvious that if chance discovery of benefits occurs at a low level of scientific activity, the occurrence of such benefits will be much more frequent at a high rate of activity, especially with our existing mechanisms for disseminating and transferring knowledge from one field of investigation to another. And—this is the most important point—the chance discoveries may well increase, not arithmetically, but geometrically, since any one investigation may provide the germ to fertilize not one, but numerous other fields. It would seem, then, with our scientific establishments at a new, high peak of activity, that we are about to reap a crop of serendipitous results which may have profund effect on every phase of life. Public health, education, national defense, business, and industry, and hence you the individual will benefit from the chain-like reaction that has been set up by the over-all expansion of the nation's research activities."

Excerpts from a recent address by Edward E. Slowter, vice president, Battelle Memorial Institute

VIGNETTE

METALS - JOINING TECHNOLOGIST

PERRY J. RIEPPEL

Metals joining is a relatively old art. As a science it is relatively young and possesses real potential. Scientists and engineers, through continuing research, are providing the solid scientific bases for a better understanding of welding, brazing, and soldering. Battelle's Perry J. Rieppel believes that technologists now have the important added obligation of helping industry to make the fullest and best use of joining know-how and applications.

Representative of the problems which now challenge the welding technologist, Perry points out, are those associated with joining the many excellent metals and alloys now considered almost unweldable. "Develop the needed principles", he says, "and methods for joining such materials will be evolved." He also sees the need for further development of processes for semiautomatic and automatic welding and brazing.

As a technologist and as chief of Battelle's division of metals joining research, Perry has participated in and directed research that has contributed materially to progress in the metals joining field. The group which he leads has gained appreciative recognition both for its basic studies and technological accomplishments. Its theoretical studies have made possible substantial advances in gas-shielded welding and in the development of high-strength electrodes for welding low-alloy, high-strength steels, and its investigations have thrown new light on the basic factors in the brittle fracture of large weldments. It has developed high-temperature brazing alloys, has made contributions to the solution of metals joining problems associated with fuel elements for nuclear reactors, and has added to knowledge about welding metals such as titanium and zirconium.

Perry's research has led to eight issued and pending patents. It also has served as the basis for a score of articles. One of these, "Arc Atmospheres and Underbead Cracking", was awarded the American Welding Society's Lincoln Gold Metal Award for the paper that contributed most to the development of welding in the year 1947. Over the years, Perry has been an active member of both the American Welding Society and the American Society for Metals.

Perry's interest in metals joining was developed early through his work in his family's machine shop. After receiving his B.S. in mathematics and the physical sciences from Mansfield State College, Perry made a detour into the field of teaching. During World War II, he returned to welding as an engineer with the Curtiss-Wright Corporation, Airplane Division. He joined Battelle in 1943.

Perry and his wife, Ruth, have two teen-age sons and a younger daughter. In addition to participating in the activities they generate, Perry finds time to hunt and fish, manage a Pony League baseball team, and work with the local civic association.

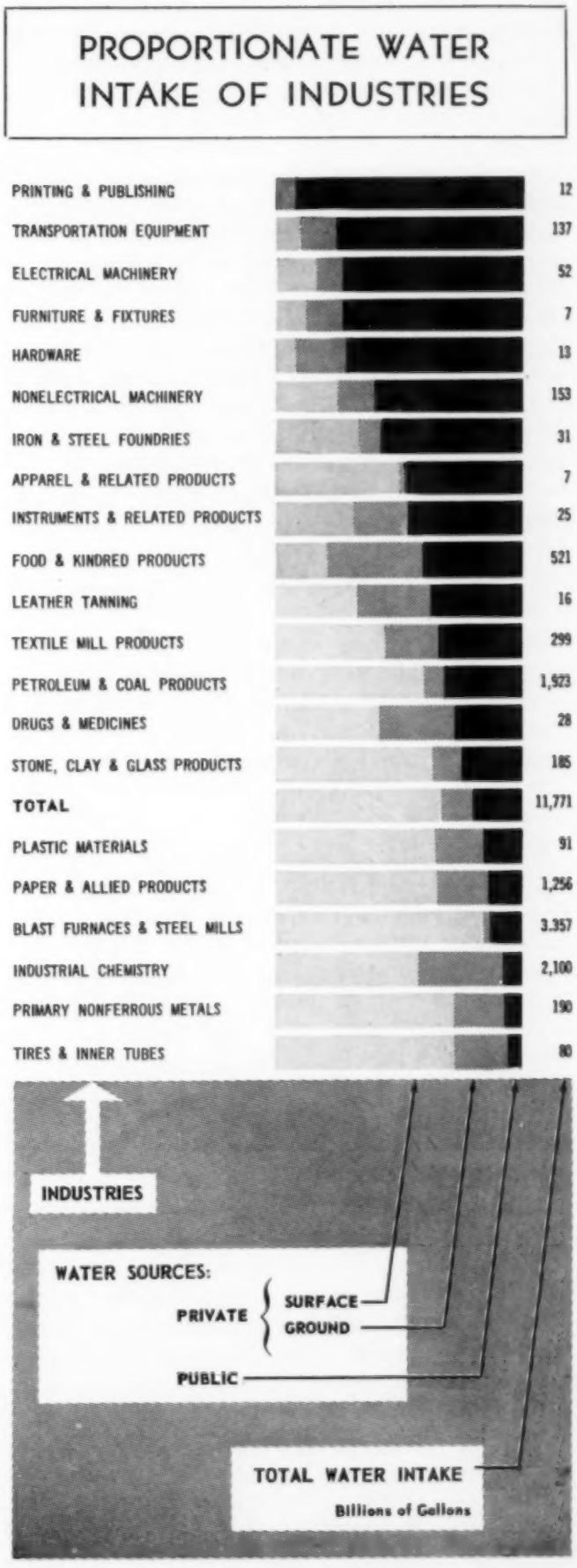
Water in Area Industrial Development

by THOMAS D. BEST *and* ROBERT C. SMITH

Water, a vital resource for many industries, is receiving particular attention in plans of industry location. Emphasis upon shortages notwithstanding, the authors suggest that the supply picture is not as dark as it is sometimes painted. They put the situation in perspective and present data helpful to those concerned with industry-location problems.

THE WATER NEEDS of American industries are of vital interest and importance to states, regions, and communities throughout the United States. Many of these areas are concerned with attracting manufacturing plants, and since water supply is important to the location of a plant, industrial water needs must be understood by groups concerned with promoting industrial development.

Municipal and industrial demands for water have been growing tremendously during the past ten or fifteen years. These demands will continue to grow and they will grow at an even faster pace than in the past. Mr. Harry E. Jordan, Secretary of the American Waterworks Association, estimates that municipal water needs will increase by 67 per cent in the next 25 years. Mr. Kenneth M. Lloyd, Secretary of the Mahoning Valley Industrial Council, estimates that industrial water needs will more than double by 1975. Walter L. Picton, Deputy Director of the Water and Sewerage and Utilities Division of the Business and Defense



Services Administration, has said, ". . . careful planning for development and allocation of water resources will be required to advance the economic development of each area and region of the Nation. Achievement of this goal will tax the foresight and ability of the Nation's planners for the next two decades."

Broad statements like the foregoing show the general, nationwide trend; but they should not be misunderstood. The average population per square mile in the United States is of no use in estimating the population of either New York City or the Mojave desert. Neither are broad statements as to water shortages and needs directly applicable to evaluating local water problems especially as a guide to potential area development. To do an effective job of industrial development—whether attracting new plants or fostering the growth of existing plants—it is imperative that industrial development groups see water supply in its proper perspective.

Water As a Factor in Plant Location

A community with an abundant supply of water, which is readily and cheaply available, does not necessarily hold the golden key that unlocks the door to the wealth that may come with large industrial development. Nor is a community with only a small supply of water necessarily shut off from further industrial development.

The location of modern plants is largely determined by consideration of definite economic and production factors. In addition to water supply, these factors include raw materials, fuel or power, transportation costs and services, labor supply, physical sites, "non-economic" community factors, and state and local taxes. The community with an abundant supply of water will fail to attract industry if it falls short in these other factors. On the other hand, communities with only small supplies of water, if they measure up in these other factors, may be able to attract industries whose water needs are not so great, or they may be able to overcome water shortages through modern water technology.

The water requirements of industry range over a wide area between industry types. Even within one industry type, the water requirements per unit produced differ. A steel mill in Ohio uses 65,000 gallons of water to produce a ton of steel. A steel mill in the northwestern United States uses only 2,000 gallons of water to produce a ton of steel. There is little to be gained in going after a plant that requires ten mgd (million gallons a day) if the water that can be supplied is only two mgd. There is little to be gained *unless* other local factors make the community so attractive to an industry that it becomes economically feasible to, in a sense, increase the two mgd to ten mgd through treatment, reuse and/or plant water conservation measures or to actually increase the two mgd to ten mgd or more by the development of an additional supply. Some industries prefer to develop their own supplies. Such industries can be attracted to an area even though the community supply falls short of the plant's demand—if the area contains abundant water that can be developed.

It is important for groups concerned with promoting industrial development to understand the water needs of industry and their own area's public and private water supply possibilities and limitations, and to have some comprehension of the ways in which deficiencies can be overcome. They must also understand other features of water supply such as local and state water laws, waste disposal needs and problems, and the effect of the chemical quality of the waters. Although water is not the only factor in plant location, it is an important factor. A lack of knowledge of the local water situation can lose a prospective plant just as

Thomas Best's studies in the field of economic geography have given him a natural interest in the relationship of water to industrial problems. Since joining Battelle this interest has been intensified by his participation in area appraisal studies involving the water problems of industries and communities. As a member of the Institute staff he has also been associated with a variety of economic studies. He holds both B.A. and M.A. degrees in economic geography from Northwestern University.

Robert Smith, who recently joined the Battelle staff, has broad experience in the field of water resources. Following World War II, he was associated with the Water Resources Division of the U. S. Geological Survey for a number of years, several of them as District Geologist for West Virginia. More recently, he has been Assistant Chief of the Ohio Division of Water. As an appointee of the Governor of Ohio, he was Secretary of the Advisory Committee on Ohio's Water Resources during 1954 and 1955. Smith is author of almost a score of publications relating to the evaluation of water resources and the science of hydrology.

quickly as a lack of water. Modern technology and methods of study make it readily possible for a development group to obtain the needed knowledge from specialists.

Volume Requirements of Industry

Several public and private agencies and organizations have attempted to estimate or measure water use in the United States. There are many obstacles to obtaining accurate water use statistics, and each report differs somewhat, but they all tend to show the magnitude of the water withdrawals and can be used as a guide to water requirements by types of industry.

In the United States, industrial water requirements rank second only to those of agriculture. Municipal use for domestic and business purposes is but a fraction of that used in manufacturing or consumed by irrigation. In the more industrialized and humid East, industrial water requirements are far greater than the requirements of agriculture. In the more arid West, where farming depends on irrigation, agricultural water requirements are greater than industrial requirements. Most of the water used by industry can be regarded as available for other purposes after its initial passage through a plant, although its purity may be impaired and its temperature raised. Industrial water use is a withdrawal use, a non-consumptive use. Most of the water withdrawn for irrigation returns to the atmosphere as it evaporates or is transpired by vegetation. Irrigation is a consumptive use.

Industrial withdrawal of water of 11,430 billion gallons in 1953 is reported by the 1953 U. S. *Annual Survey of Manufactures*, a compilation only for establishments reporting an annual withdrawal of 20 million or more gallons. The *Survey* figure is higher than the findings presented in the 1947 *Census of Manufactures* of about 8,000 billion gallons and somewhat lower than those of *Water in Industry*, the survey published in 1950 by the National Association of Manufacturers and the Conservation Foundation. The latter tallied nearly 3,000 billion gallons of water used in 1950 by industries canvassed (representing 1.4 per cent of all industrial plants) and about 20 per cent of all plants believed to be major users of water.

Concentration of high water use in a limited number of industry types is evident in all surveys and estimates. On the basis of industry types, the NAM-Conservation Foundation survey points out that petroleum products, paper and pulp, electrical (principally power generation), leather, plastics, chemicals and drugs, foods, beverages, and tobacco, and iron and steel plants are the major water-using groups. Numerous plants in these industries report withdrawals of ten million gallons per day or more. The 1953 *Annual Survey* excludes the commercial power-generating category included by the NAM and ranks industry types on the basis of aggregate volume used, rather than the rate of withdrawal by individual operating units. In terms of these totals, the 1953 *Annual Survey* rates blast furnaces and steel mills as the leading industrial water users, accounting for some 3.4 billion gallons per year. Petroleum refining ranks second with about 1.6 billion gallons and industrial organic and inorganic chemical manufactures each account for somewhat lesser volumes of water. Pulp, paper, and paper board mills aggregate a withdrawal of 1.2 billion gallons. Aside from the food and kindred products group, no other industry type reported by the 1953 *Annual Survey* withdrew more than one-half billion gallons in that year.

About one-fourth of all plants sampled by the NAM-Conservation Foundation Survey reported intakes of less than 10,000 gallons per day (gpd) and about half of all plants required less than 50,000 gpd. One-third of all plants withdrew more than 250,000 gpd, and one-twentieth of the total number of plants responding to their survey reported daily intakes in excess of ten million gpd. Almost four-fifths of the total water intake reported to the NAM was used by the relatively few plants requiring more than one million gpd.

The industrial water-use picture is lightened appreciably by consideration of the use of the water taken into plants. Close to half of the water is used for cooling of equipment or product and thus may be returnable or reusable. Moreover, according to the NAM-Conservation Foundation survey, the cooling function is most important in the large-volume water-using plants. The average allocation of water use in plants using ten million gpd or more is roughly one-half devoted to cooling, one-third to process use, and about one-tenth each for boiler feed and sanitary and service functions. The average plant using less than that daily volume used three-eighths of its water for process purposes, one-fourth for cooling, one-fourth for sanitary and service functions, and one-eighth for boiler feed.

The tremendous differences in operational practices, scales of operation, and similar production elements discourage the compilation of more detailed statistics of the probable needs of a given type of industrial plant. Yet these are the statistics that are more meaningful to industrial development groups. *Water in Industry*, a survey by the National Association of Manufactures and the Conservation Foundation, lists water use per unit of product for certain types of industry. It may be valuable as a guide to determining water needs by type of industry.

It is obvious that there is a wide range in the water

requirements of individual plants of the same industry types. Generally the range in requirements reflects the range in availability of water. It also reflects that degree to which modern technology can reduce the requirements.

Industrial Water-Conservation Techniques

When the supply is limited, one relatively simple but moderately expensive expedient in some areas is to design equipment to allow the use of brackish water. In some cases, substantial water savings can be effected, at some increase in initial construction cost, by designing facilities to conserve water used in the plant. Recirculation of cooling water probably is the most common practice, although wash water is often reused after suitable treatment. Recirculation of cooling water in oil refineries in the humid industrial belt has brought the ratio of water to crude oil down to 1.73:1, in contrast to 44.5:1 in a representative once-through plant. Even smaller ratios of fresh water use have been achieved in arid areas. Recirculation is common also in the steel industry. On the national average, 45,000 to 65,000 gallons of water are required to produce a ton of finished steel. Except for about one-twentieth of this volume, all is nonconsumptive use and may be returned to the source. The design of a Geneva, Utah, and a Fontana, California, plant reduced net water requirements to 3,450 and 1,400 gallons per ton, respectively.

Water may even be eliminated as a coolant if establishing an operation in a water-short locale is mandatory. "Air cooling" is sometimes used. It is a variation of a sealed water-circulation system tied to a heat exchanger similar in principle to an auto radiator. One Texas refinery has been able to substitute this method for 90 per cent of its cooling needs. In a carbon black plant in the Southwest, air cooling reduced the requirements for water to one-fourth gallon per pound of carbon black, compared with the four to eleven gallons per pound required in water-cooled carbon black plants. Although the use of refrigerants is less common, they may be substituted for water cooling in some applications.

Metal-working plants — producing machinery, appliances, tools, and similar products—are typical of plants that use relatively small amounts of water. Because the plants are characteristically small or moderate in terms of employment, the need for sanitary and service water is small. Needs of the majority of plants of this type can be met by ground water supplies in most climatic areas where such ground water is available. Moreover, the high value added by manufacture in such plants tends to reduce the relative importance of expenditures for water supply or conservation when needed. By virtue of their larger scale of operation, transportation equipment plants are generally somewhat more demanding of water.

Water Sources Used By Industry

Most of the fresh water used by industries in the United States is taken from surface sources by the individual industries themselves. About two-thirds of all industrial water withdrawn in 1953 was in this category. Primary metal, pulp and paper, and chemical industries in general tend to use surface sources more than do other industries. As a result, a strong dependency upon private surface supplies can be noted in northern New England, the central manufacturing belt, some adjacent southeastern states, Texas, the High Plains area, and Oregon.

About one-eighth of all fresh industrial water is taken from private ground sources. Food products, leather, instruments, and textile industries show above-average use of private ground-water supplies. Chemical and paper are found in this category also. This practice is reflected in strong ground-water development in most states of the extreme Southeast, the lower Mississippi Valley, the extreme Southwest, and portions of the northern Mississippi Valley.

Of particular interest to community developers is the fact that a substantial segment of American industry depends upon municipal water supplies. According to the NAM-Conservation Foundation survey, about

TYPICAL WATER USE IN MANUFACTURING

Product	*Unit*	*Water Use (in gals.)*
Rayon yarn	ton	250,000-400,000*
Cotton cloth	ton	10,000-16,000
Woolen cloth	1000 yds	340,000-510,000
Soap	ton	500-4,500
Steam generation	1000 kwh	80,000-170,000
Cane sugar	ton	4,000-27,900
Fluid milk	1 cwt	.063-2.07
Canned vegetables	100 cases	3,500-16,000
Paperboard	ton	7,700-90,000
Oil refining	1000 bbls	770,000
Refined petroleum products	1000 bbls	151,000-15,000,000
Rolled steels	ton	6,000-110,000

*The figures given here represent water usage by various companies and under differing processes. The gallonage figures are typical of the water requirements for the manufacture of the products listed.

half of all individual plants used municipal supplies. Nationally, about one-fifth of all industrial fresh water came from public sources in 1953, according to the *Annual Survey*. Printing and publishing, fabricated metal, transportation equipment, and machinery establishments, for example, all draw more than one-half their water needs from public sources. These are the principal sources for the food products, leather, iron and steel foundry, and instrument groups as well. Moreover, about one-third of all water used by the petroleum and coal products group stems from public supplies, as do one-eighth of the needs of blast furnaces and steel mills and the paper and pulp industries as a whole. A substantial proportion of the needs of the drugs and plastics groups is drawn from public sources, too. A marked dependence upon public water sources seems evident in the less industrialized areas of the Central Plains. However, industries in the heavily-developed New York - New Jersey - southern New England area, the western end of the central manufacturing belt, the Alabama-South Carolina segment of the southeast, and Washington, California, and Utah draw substantially greater proportions of their water from public sources than do those of the nation as a whole.

Other Industrial Water Factors

Although water supply is most commonly regarded as the most important water problem faced by an area development group, there are other problems that can be as difficult as providing an adequate supply. But even these can be overcome by modern technology.

In many industries, the quality of the water supply is most important, and in a few instances quality may prove to be the deciding factor in site selection. Precise quality conditions traditionally have been considered significant site-selection factors for leather, paper, and textile installations. Today, however, treatment may overcome quality problems if the cost of treatment may be overbalanced by other locational elements. The NAM - Conservation Foundation reported that nearly three-tenths of the plants contacted in its survey treated their water prior to use.

Quality defects in industrial water may affect the product, but the greatest problems in industry as a whole stem from reduction of efficiency of equipment or outright deterioration of machinery and systems by contact with water. Corrosion of metal by water containing high concentrations of chlorides, and abrasion by particles of sand and other foreign materials can erode equipment to the danger point. Minerals carried in solution may be deposited as scale, especially in high-carbonate areas, to form extremely serious restrictions in water systems. Some elements cause water to foam so badly that performance characteristics are changed. Organic growths may also block free flow of solutions.

Simple sanitary contamination is, of course, a prime hazard to food-products industries. Staining can occur in some industries, such as the paper industry, because of the deposition of colored matter or various minerals carried by the water, or because of chemical reactions with the product.

Waste products and disposal needs differ with industries. As with water supply, these needs should be considered in relation to the effect that the disposal of waste might have upon the community. Disposing of industrial waste products by using a stream to carry them away has been a sound practice. Many plants not only withdraw their own water, but also provide their own disposal systems. A substantial proportion of plants using municipal water supplies, however, discharge their wastes into city sewers. As communities grow closer together and as recreation needs increase, disposing of some types of waste can create problems. Inadequate treatment can result in the killing of fish, damage to users downstream, or destruction of a stream's esthetic values.

Modern technology can alleviate the waste problems either by treating the effluent before discharge or by handling the effluent in such a way as to avoid creating a problem. In many cases, in the treatment of industrial waste, by-products of commercial value can be recovered to partially defray the cost of treatment.

Local or state water laws can restrict the amount of water available for use. Most water laws restrict or allocate the amount of water that can be withdrawn and the use to which it may be put. A knowledge of water laws is important to an area development group; but just as deficiencies in water supply do not prevent industrial development, restrictive water laws need not prevent this growth.

The Role of Development Groups in Water Supply

Realistic appraisals of the industrial water picture need seldom discourage sincere, objective area development groups. Few regional or state groups would be unable to attract some kind of industries somewhere within their territories if they have other assets attractive to industrial development. A necessary first step in the consideration of water as a factor in local industrial development is the making of a definitive analysis of local water conditions. More must be known about water than the quantity and quality deliverable through city mains and the public facilities available for waste disposal. The potential volume available

from various sources must be determined. As an absolute minimum, area promotional groups must be able to present these facts together with detailed data about the precise districts in which water can be delivered or developed.

Beyond this, area groups must anticipate the future supply. The increasing demands of present users (including that of the naturally increasing population) must be estimated and added to the current rate of use. In estimating the maximum amount that can be developed, it is necessary also to remember that some portion of the volume available for new use must be allocated to new domestic and municipal use that will result from industrial expansion. The possible growth of other large volume uses must also be considered, as for example, agricultural irrigation, which is being increasingly used in humid areas.

The most effective use of water for area development would result if patterns of potential industrial sites could be superimposed upon the patterns of potentially available industrial water, and if industrial areas could be developed so as to balance availability with demand as the need might arise. Without proper consideration, it is entirely possible that natural water may be lost to future development through faulty growth performance. The minimum requirement in this field of effort would call for enforced designation of appropriate water-source areas for the development of industry.

In all likelihood, however, the drawing power of an area might be most greatly improved by prior development of water sources into an industrial water supply. At least three forms of this action are now apparent. (1) Water sources might be developed into specialized industrial systems designed to supply future industrial construction at the source site. (2) A water source area for which residential or other non-industrial surface growth might be expected or preferred might be tapped for its water to service industrial development elsewhere in the vicinity in such a way as to leave the surface unimpaired. Most logical, perhaps, for the majority of communities would be (3) development of all sources into municipal water destined to fill any need within and near the existing community.

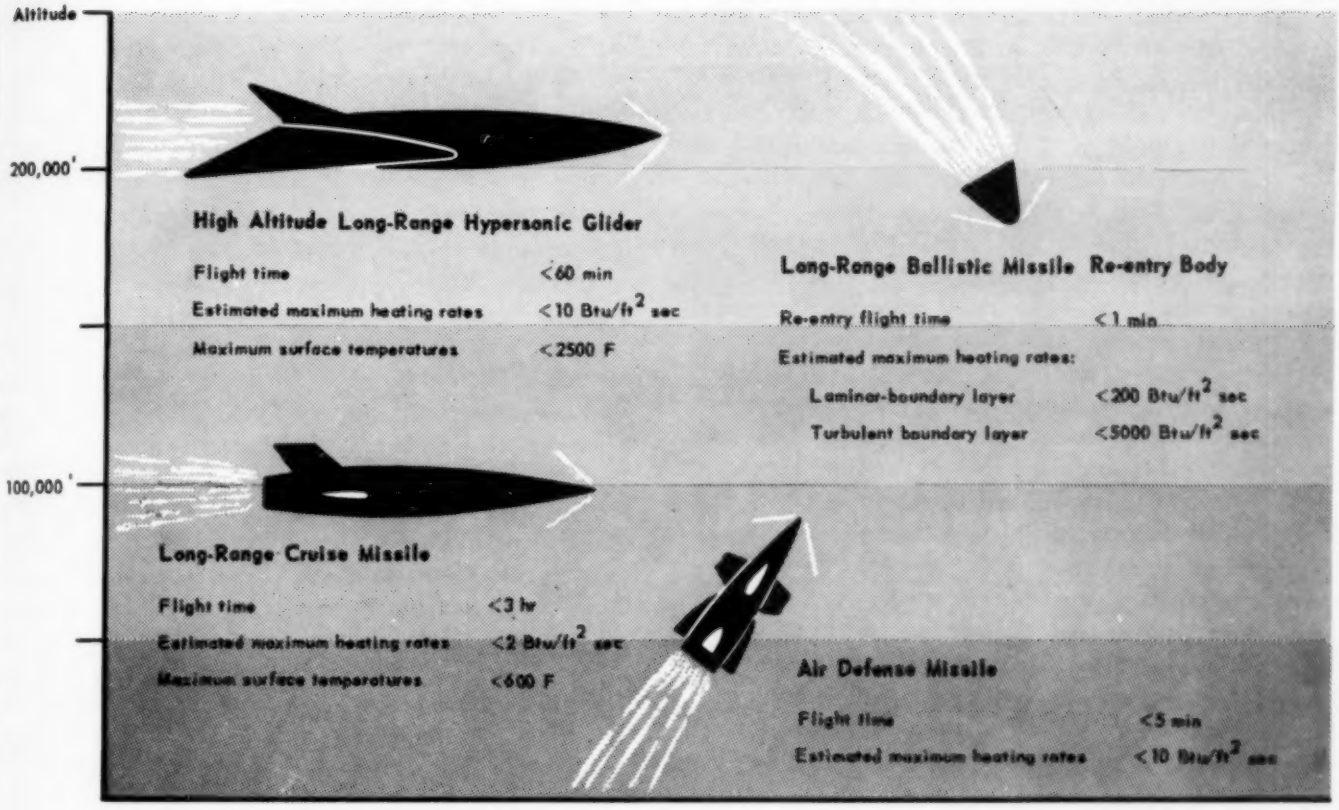
Maximum development of water resources may or may not be an expensive project, but the benefits from such development can exceed the investment. Despite the fact that numerous industries would be unswayed in their locational procedures, a substantial share of the site-seeking firms might find such a development significant far beyond the mere availability of water. Preparation for growing water use with an insight into industrial needs probably would be regarded as an indication of the community's concern for intelligent planning. As sites in areas currently regarded as premium are absorbed by industrial and commercial growth, the water advantages of areas with some handicaps may increase their desirability.

The recent widespread publicity about water shortages may have caused some industrial development groups to place undue emphasis on water. But it is equally possible for area development groups to be too complacent about water. A rising standard of living will add domestic water-consuming gadgetry. Development of water-consuming operations now present in limited numbers—for example, atomic reactors with voracious appetites for cooling water—may be joined by functions presently unknown in practice to command substantial quantities of water. Technology often can overcome significant portions of the basic needs for water, but costs seem likely to rise as treatment and conservation practices are expanded. It seems almost certain that water supply is destined to become an increasingly significant factor in site selection.

ONLY INFALLIBLE CRITERION

"Actual experiment is the only true touchstone of theories, the only infallible criterion by which we can discriminate between theories formed on principle and the chimerical projects of a vague imagination."

Eli Whitney


Altitude
200,000'
100,000'
High Altitude Long-Range Hypersonic Glider
Flight time <60 min
Estimated maximum heating rates <10 Btu/ft² sec
Maximum surface temperatures <2500 F
Long-Range Ballistic Missile Re-entry Body
Re-entry flight time <1 min
Estimated maximum heating rates:
Laminar-boundary layer <200 Btu/ft² sec
Turbulent boundary layer <5000 Btu/ft² sec
Long-Range Cruise Missile
Flight time <3 hr
Estimated maximum heating rates <2 Btu/ft² sec
Maximum surface temperatures <600 F
Air Defense Missile
Flight time <5 min
Estimated maximum heating rates <10 Btu/ft² sec

Aerodynamic heating. Temperatures shown do not necessarily represent actual material temperatures, but rather possible maximum temperatures that components may be exposed to during certain flight conditions.

High Temperature and Future Flight*

New propulsion systems make higher air speeds possible, but they also create challenging heat problems for the engineer. Here are some of the problems that must be solved as faster flight vehicles are developed.

by FREDERICK L. BAGBY, JR.
and Associates

RECENT ADVANCES IN PROPULSION systems for aircraft have brought scientists and engineers all over the world face to face with the prickly high-temperature problems associated with high-speed flight. The principle of jet propulsion has been extrapolated into new concepts which have enabled military planners to develop new families of supersonic and hypersonic air weapons. The actual accomplishments, let alone the promises, of these new vehicles suggest that the conquest of space has passed beyond the dream stage.

To the aeronautical engineer, the effects of high-speed flight have taken the more technical form of high-temperature environments arising from aerodynamic heating and energy conversion processes. Many details about these new environments are unknown, and temperature extremes can be foreseen that are beyond the ordinarily understood capability of known engineering materials to withstand. A demand has thus been created for the development of a new technology, wherein old concepts of structural design and materials use must be replaced by new concepts not as yet completely formulated.

*This article formed a portion of "Engineering for the High Temperature Age of Flight", which appeared in the August and September, 1957, issues of *Astronautics*.

The fact that temperatures resulting from aerodynamic heating increase with increasing flight Mach numbers has led to general acceptance of the term "thermal thicket" as the proper description of the nature of the problem. A second, more careful look at the situation now indicates there are compensating factors which tend to make the aerodynamic heating aspect of the "thicket" less formidable than first assumed. These factors are the relatively short flight times involved in the operation of high speed vehicles; the reduced heating rates encountered in the upper, less dense portions of the atmosphere; and the fact that the radiation of absorbed heat back to the surrounding atmosphere may reduce the net heat input to a vehicle by substantial amounts.

Nor is the high temperature problem facing aircraft and missile engineers at this time strictly a matter of temperature alone, since other aspects of the problem can under most circumstances be even more important. Take, for example, rates of heat transfer, total quantities of heat involved, and chemical reactions associated with high temperature. A thorough understanding of these facets of the problem is a prime requisite for the ultimate attainment of design objectives.

High-Temperature Problems

A "high temperature" problem can exist in temperature ranges as low as 200 to 400 F. In this region, hydraulic fluids and rubber seals now available present a definite limitation to designers.

High temperatures realized in airframes of manned aircraft flying in the stratosphere depend on a number of factors. Rocket-powered research aircraft have reportedly reached speeds above 1900 mph in the upper atmosphere. At these speeds, airframe parts of near-future aircraft might encounter temperatures of at least 1000 F as a result of aerodynamic heating.

Temperatures encountered by guided missile airframes, exclusive of re-entry bodies, will undoubtedly reach higher values than those for manned aircraft, at least in the near future. Unmanned aircraft or cruise type missiles generally present the same problems with regard to aerodynamic heating as manned aircraft. Guided missiles of the ordnance or aeroballistic types, such as surface-to-air and air-to-air missiles, can generally be expected to reach higher velocities than aircraft types. Reports of research rockets attaining velocities of 4500 mph indicate that temperatures of 3000 F and up may be encountered in the near future by the aeroballistic missile airframe.

The problem of "high temperature" is a long-standing one in the case of air-breathing propulsion systems. Turbine inlet temperatures of 1600 F and better represent the current level of accomplishment in gas turbine engines. Since such engines operate essentially at steady-state conditions for long periods of time, turbine inlet temperatures will usually also represent maximum material temperatures unless cooling techniques are employed. Turbine inlet temperatures greater than 2000 F can now be foreseen.

Combustor and tailpipes for gas turbines, afterburners and ramjets represent combustion system components exposed to flame temperatures. Fuels used in these propulsion units can burn with flame temperatures ranging up to 4000 F, and thus represent an upper temperature limit to which air-breathing engine components may be exposed.

Rocket engines are another example of the high-temperature extremes the engineer must contend with. Chemical rockets, which convert the heat from combustion into kinetic energy of the products of combustion, can have flame temperatures ranging from about 4000 to 9000 F. The nuclear rocket, using the fission process as the heat source, and light gases such as hydrogen or ammonia as the working fluid, will generate thrust in the same manner as the chemical rocket, probably at temperatures of about 3000 to 5000 F.

Of current interest is the high temperature region associated with the re-entry of such bodies as nose cones of long-range ballistic missiles, satellite vehicles designed for re-entry and boost-glide vehicles. Depending upon their kinetic energy and flight path, temperatures from 2000 to over 15,000 F may exist in a boundary or shock layer.

Finally, as an upper limit, there are the temperatures embodied in the photon rocket concept. This type of rocket, postulated thus far in theory only, involves temperatures associated with the conversion of matter

The senior author, Frederick L. Bagby, has recently guided and participated in numerous aircraft and guided-missile studies. These studies have been primarily concerned with aerodynamics and flight propulsion and the relation of these fields to air-weapon systems development. Earlier, he had investigated combustion problems associated with the development of furnaces, boilers, and water heaters. Prior to joining Battelle, Bagby had served as a production design engineer with Curtiss-Wright Corporation's Airplane Division.

His associates in the preparation of this article were William A. Spraker and John M. Allen.

Propulsion Systems—Some Selected Characteristics

Type	Temperature ranges, F	Comments
CHEMICAL REACTION		
Ramjets and turbojets	2000-4000	Products of combustion of JP-4 and air are corrosive to combustor and tailpipe materials.
Solid propellant rockets	2500-5000	Typical propellant grain would be ammonium perchlorate and a fuel such as C_2H_4O. No cooling for nozzle and combustor so operating times are limited.
Standard liquid propellant rockets	4000-5700	Typical propellant combination is JP-4 and lox. Heat fluxes in throat of nozzle can exceed 3000 Btu/ft.^{2} sec. Chamber pressures up to 1000 psi and erosion from gas flow and combustion oscillations place extreme demands on materials.
High-energy liquid propellant rockets	up to 8500	Use of high-energy propellants such as H_2 and F_2 will result in more severe service conditions than for conventional propellants.
Free-radical fueled rockets	3000-5000	Use of free radical fuels represents an attempt to increase specific impulse of chemical rocket up to the order of 1000.
HEAT TRANSFER		
Nuclear rocket	3000-5000	Nuclear fission is source of heat for accelerating light gases such as H_2 and NH_3. Will represent difficult materials problem.
Plasma jet	up to 20,000	High-energy electric arc supplies energy to produce hot, ionized light gases which are discharged through conventional convergent-divergent nozzle.
Solar	up to 8000	Solar collectors gather radiant heat which is then transferred to a working fluid such as light gases.
ION ACCELERATION		
Electrostatic acceleration of ions	—	Ions such as those of sodium are accelerated by electric fields. Nuclear reactor required to provide electric power. System only applicable to space flight because of low thrust-to-weight ratios.
PHOTON		
Conversion of matter to light energy	temperature up to 10^8F possible	Principle based on conversion of mass to energy according to Einstein relation, $E = mc^2$. No material known with high enough reflectivity to collimate light without the material melting from absorbed heat.

to light energy. These may exceed 100,000,000 F, and represent physical conditions completely beyond the scope of current propulsion technology.

The examples of high temperatures depicted in the chart show that no single temperature can be arbitrarily set as the beginning of the high temperature problem. Rather, the combination of material characteristics and operating environments typical of aircraft and missiles has resulted in a spectrum of high temperature problems.

Propulsion technology has generally been the pacesetter for aeronautical progress. The consistent and sometimes spectacular advances in speed range and altitude of flight vehicles reflect the advent of powerplants with continually increasing thrust-to-weight ratios. This progress is also the reason why the airframe designer now finds himself in the middle of the aerodynamic heating problem. Propulsion system temperatures have always limited the power-plant designer and challenged the materials engineer.

The propulsion system table above is divided into four categories, of which the chemical reaction category represents the class of jet propulsion systems generally in current use. The heat transfer category covers rocket propulsion systems in which heat obtained from an external source is transferred to a light

gas, which then provides thrust by discharging through a nozzle in a manner similar to combustion-type rockets. Heat transfer rockets potentially offer higher specific impulses than can be obtained in chemical reaction rockets because the low molecular weights of gases such as hydrogen can be exploited advantageously. Ion acceleration and photon rockets represent new types of interest because of their promise for space flight applications.

Thermal Service Conditions

Temperatures and heat fluxes in the combustors and throats of solid and liquid propellant rocket engines represent as severe a combination of thermal service conditions as are likely to be encountered in the aeronautical engineering field. Erosion of the nozzle throat area is also severe because of the high gas pressures and gas velocities. Sonic velocities in the nozzle throat can reach values as high as 5000 fps. Regenerative cooling of the combustor and nozzle is the present means whereby material temperatures in the combustor and nozzle throat of liquid propellant rockets are maintained at a reasonable value, and this technique will continue to be required in the future. Use of high-energy liquid propellants or free-radical fuels in an effort to improve engine performance will impose severe demands upon combustor materials, and could ultimately require the use of a more effective means of cooling than the regenerative method.

Equipment associated with liquid propellant rocket engines, such as pumps and controls, presents its own temperature problems. Where liquid oxygen is to be handled, the problem is one of low temperatures, ranging down to —297 F. Electronic and hydraulic control system components adjacent to the combustor can reach temperatures of several hundred degrees, and hence present problems as far as fluids and insulation are concerned.

Rockets utilizing the heat transfer principle represent an immature art at the present time. Problems in containing high-pressure, high-temperature gases will be similar to those encountered in combustion rockets. Also, erosion conditions with respect to heat exchangers can be severe. With plasma jets, a need may exist to cool the electrodes of the high intensity arc in which the gases will be heated and ionized.

Ion acceleration and photon rockets represent concepts which are essentially still in the theoretical stage. The high-temperature problems associated with the photon rocket, as noted, are beyond the capabilities of current technology. Temperature problems in ion rockets are not yet clearly defined, but probably will be most severe in the nuclear power reactor. Complicated by strong radiation and electric fields, the problems of the ion rocket are likely to strain the state of the art in numerous fields, including materials.

Aerodynamic Heating

Aerodynamic heating is the area of high-temperature technology currently of most concern to aeronautical engineers. Progress in understanding the gas dynamics of supersonic and hypersonic boundary layers, plus the knowledge gained from preliminary design studies of various types of vehicle concepts, have brought the essential facts of the problem into reasonably good focus. But the phenomenon of aerodynamic heating is still not completely understood.

The illustration on page seven demonstrates the aerodynamic heating problem in terms of four types of high-speed flight vehicles. Each represents a particular phase of the problem.

The air-breathing-engine-powered, cruise-type missile is a logical extension of present long-range manned or unmanned aircraft. At altitudes of 60,000 feet or better, high flight speeds can be maintained for long periods with reasonable fuel consumption. Also, the maximum heat transfer rates to the air frame, because of aerodynamic heating at such altitudes, are less than 2 Btu/ft^2 sec—not much greater than those encountered by a transonic fighter flying at maximum speed at low altitudes. This comparison shows the important effect of reduced air density on heat transfer rates, since rates of over 50 Btu/ft^2 sec could occur for Mach 3 flight at low altitudes.

But while the cruise missile will encounter relatively low heat transfer rates, the long duration of flight will eventually cause the temperature of portions of the airframe, assuming no cooling or use of insulation, to approach about 600 F. It is this ultimate structural temperature which represents the problem to the cruise missile airframe designer.

At temperatures of about 600 F, lightweight structural materials such as aluminum and magnesium decrease drastically in strength. This means a heavier structure must be provided for sustained Mach 3 operation than for lower temperature flight conditions. It also means that, in addition to all of the structural and materials criteria previously considered, the variation in material properties with temperature must now be taken into account. This suggests use of materials such as titanium and steel to obtain the lightest weight structure for flight at the new temperature level.

Structural materials per se present no immediate temperature limit to the cruise missile designer, since many which are available are usable at temperatures substantially above 600 F. Achieving an optimum

structure design has become time-consuming, however, because of the need to account for all materials and structural combinations at the designers' disposal.

High speed air defense missiles represent an aerodynamic heating problem of a highly transient nature. With the possibility of high supersonic Mach number flight in the lower atmosphere, aerodynamic heating rates of up to 10 Btu/ft² sec could be encountered. However, total flight time will probably be small, say less than 5 min. Therefore, it is not likely that heat transferred to the missile structure will increase airframe temperature to a level where material properties are adversely affected, except possibly at stagnation regions such as the body nose and leading edges of lifting or control surfaces.

Localized hot spots, plus the rapid transient nature of heating, can, of course, induce large thermal gradients in the airframes of such missiles and thus lead to complex thermal stress patterns that must be allowed for. But standard airframe materials such as aluminum can be used effectively under such transient heating conditions; and except for radomes, no particular material limitations are anticipated for the airframes of short-flight-time aeroballistic missiles.

The role of heat radiation in aerodynamic heating is demonstrated by the long-range hypersonic glider. This type of vehicle is predicated on the assumption that lift can be obtained in the extreme low density air above altitudes of 100,000 to 150,000 ft. Hence, although the glider may have an initial velocity of Mach 10 or greater, it can decelerate gradually in the thin upper atmosphere so that maximum heating rates may never exceed 10 Btu/ft² sec. Under such flight conditions, and assuming radiation heat transfer laws between the surface and space are not affected by properties of the boundary layer, heat input to the airframe can be radiated outward at the same rate when airframe surface temperatures approach 2500 F.

Metal Hypersonic Gliders

Structural designs for hypersonic gliders can only be speculated on at present. Metals not now commercially available might be developed to function structurally at temperatures approaching 2500 F. But, because of the limited flight time, the possibilities of either using insulation on the outside of the airframe or of cooling the sub-surface structure appear more promising. In either case, the design engineer will be confronted with additional degrees of complexity, compared to the two previous vehicle types, in trying to arrive at an optimum airframe structure.

Re-entry of long-range ballistic missile nose cones can unquestionably be considered the extreme example of the problem of aerodynamic heating. By proper choice of weight and drag characteristics of the re-entry body, and if laminar boundary layers can be maintained during the re-entry period, heat inputs at rates as low as about 200 Btu/ft² sec may occur. However, if the boundary layer becomes turbulent, these heating rates may increase tenfold or more. In either case, heat inputs are several orders of magnitude greater than indicated for vehicles discussed earlier.

Unconventional Approach Used

Designing for the intense rates of heating that nose cones must withstand has placed great emphasis on the unconventional approach for obtaining a minimum weight structure. Both thermal capacitance and thermal protection design options have been discussed in the literature. Since the re-entry time of flight can be small, materials that will absorb large quantities of heat, and also conduct the heat away from the heated surface fast enough to prevent melting or undue reduction in strength of the surface, offer the best prospect for thermal capacitance types of structures. Provision will have to be made for the surface protection of such structures if they are made of materials vulnerable to erosion and oxidation.

For the thermal protection type of design, the need will be for materials with low thermal diffusivities, so that surface temperatures will be high enough to melt, vaporize, sublime or ablate away while the subsurface material retains its structural integrity. Special instances of the thermal protection approach would be transpiration cooling and surface combustion reactions.

Common to all design approaches for re-entry nose cones will be the problem of thermal shock. Also, the characteristics of the boundary layer and of air flow over the nose cone must be taken into account. For example, the phenomena of dissociation and ionization of the air in the shock layer and boundary layer and subsequent recombination can influence heat transfer rates significantly. Furthermore, during flight in the extreme outer atmosphere, the potential interaction upon impact between individual air molecules and the molecular structure of the material on the nose cone surface could be important.

This review of the high-temperature problems facing engineers suggests difficulties that must be overcome. Further experience with high-speed flight vehicles now operating or in experimental stages will provide more knowledge and needed perspective. Moreover, the broad attack upon the all-important materials problem, will help aeronautical engineers to conquer the critical heating problems. There can be little doubt that with this effort, science and engineering will provide us, in the not too distant future, with components and systems for flight vehicles with high temperature capabilities well beyond those existing today.

NOTES from BATTELLE

BOOKLET ON REACTORS

A booklet containing data and illustrations on research reactors now in operation or being built in the United States has been made available to the public by the U. S. Atomic Energy Commission. Titled *U. S. Research Reactors,* the booklet was edited by nuclear scientists at Battelle working under contract with the A. E. C.

The new booklet contains data and illustrations on more than thirty research reactors in actual operation or under construction in this country. These reactors are classified according to type: Light Water Moderated (Pool and Tank Types), Heavy Water Moderated, Graphite Moderated, Homogeneous, and Reactors for Safety Research. One or two reactors within each classification are described at length as typical examples.

U. S. Research Reactors was compiled to acquaint those interested in reactors, as research tools, with the present range of size and power of such equipment. Cost figures are included for those interested in the economic aspects of research reactor construction. Battelle's Joel W. Chastain, who served as editor of the booklet, describes it as a "bird's-eye-view" of the present state of the art of research reactor construction and usage. Clyde R. Tipton, Jr., and Don H. Stall, also of Battelle, assisted him in the preparation of the 73-page booklet.

Copies, at $1.50 each, may be purchased through the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C.

PSYCHOCHEMISTRY

Recent years have witnessed the discovery and investigation of many chemical compounds that affect the human brain. Some of the most widely known of these are the group called tranquilizers. Less publicized, but perhaps equally important, are a number of substances known as psychotogens, which create in normal persons the symptoms of various mental illnesses. These drugs may well be helpful in learning more about the origins and causes of mental illness. Still other compounds produce convulsions or induce sleep.

Investigators have found that the many different types of compounds affect the human brain. In addition, they know that compounds having widely different actions on the brain may be partially alike in chemical structure, that is, they may contain some of the same chemical units. It is these "similar" chemical units that are being studied at Battelle Institute in research sponsored by the National Institute of Mental Health, Department of Health, Education, and Welfare.

The investigation at Battelle, which is a continuation of previous research, is being conducted by Dr. Richard D. Morin, in association with Dr. Frederick Benington and Dr. Edward Kropa.

"We hope," says Morin, "that such an investigation will lead to a better understanding of the relationship between the chemical structure of a substance and the nature of its effects on the brain." Although he doesn't expect any sweeping, final answers from such a study as this, Morin does believe that it can result in a greater understanding of the importance and the actions of certain chemical building blocks found in many of the compounds that affect the brain.

"Moreover, it is not improbable that through such an investigation one may be able to design entirely new psychochemicals, using as building blocks fragments of compounds having known and possibly proven psychic response," speculates the Battelle organic chemist.

The general steps in this research covered by the 12-month Public Health Service grant are these: Morin and his associates will select a chemical known to affect the brain. They will alter it in some respect, by adding or removing one or more of the several chemical building blocks that are of primary interest to them. Even to do this may be quite a trick, since the construction of organic chemical compounds is an art all its own.

Then come experiments with laboratory animals to learn what reaction the drug produces in the brain and whether it is toxic. These are conducted under the direction of Dr. Leland C. Clark of Fels Research Institute, Yellow Springs, Ohio, with whom Morin, Benington, and Kropa have collaborated in previous studies. When studies reach these more advanced stages, the Battelle scientists also work in cooperation and consultation with representatives of the Ohio State University Medical School and the Columbus Receiving Hospital.

METAL SPRAYING OF URANIUM

The protection of uranium from corrosive attack in water is a problem that has received considerable attention. Various methods for providing such protection have been investigated. In a study made in 1952-53, and recently declassified, the possibility of spraying protective metal coatings on uranium was investigated. Progress was encouraging, but the development of other coating methods cut the work short.

Robert E. Monroe, David C. Martin, and C. B. Voldrich, Battelle technologists who participated in the study, report that the development of a satisfactory spraying technique was a key problem. Since the spraying of the metal had to be done in an inert atmosphere, conventional equipment could not be utilized or adopted. As a result, special arc-spraying equipment was developed and used in the study.

Molybdenum, titanium, and zirconium were considered as possible coating materials; the latter was chosen because previous studies had shown its superiority when alloyed with uranium. The sprayed zirconium coatings contained considerable porosity, which indicated that improvement in the operation of the arc-spraying equipment is desirable.

Efforts to make the coated surface more corrosive-resistant by diffusion heat treatments were largely unsuccessful. The technologists concluded that compacting the coatings by rolling, peening, or pressing, before heat treating, may be a necessary step.

Further study on this problem, Monroe, Martin, and Voldrich believe, should include careful consideration of these additional factors:

- The surface condition of the uranium at the time of spraying.
- Preheating of the uranium before spraying.
- Movement of the uranium relative to the arc.
- Operating conditions of the arc-spray equipment necessary to produce finer sprays when using zirconium in argon or helium atmospheres.

METAL SANDWICH STRUCTURE

Because of their high-strength-to-weight ratios, metal sandwich structures are of interest in a number of structural fields. A summary of available information on stainless steel and titanium sandwich structures has been issued by the Titanium Metallurgical Laboratory at Battelle.

The report points out that research in various laboratories has been directed toward development of sandwiches that remain structurally sound at elevated temperatures.

Experimentation to date shows that under conditions of heat and extreme vibration this type of construction has excellent fatigue characteristics, equal to or better than conventional type structures. Progress has been sufficient in the development of a stainless steel sandwich to permit its use in the B-58 supersonic bomber.

Brazed stainless steel sandwiches with a honeycomb-type core have been fabricated in flat and curved panels that are used in the heat treated condition. They have comparatively high strength-to-weight ratios in the temperature range from 600 to 900 F. However, there are still a number of problems that must be overcome before stainless steel sandwich structures can be fully utilized. Among these is the need to reduce the amount of hand labor required to fabricate the panels and to improve joining methods. The summary report includes a discussion of fabrication techniques used to produce sandwich structures and methods of evaluating them. Sections are also included on the development work under way in various laboratories on sandwich structures.

Authors of the TML report are W. J. Lewis, G. E. Faulkner, and P. J. Rieppel, of Battelle. The Titanium Metallurgical Laboratory is supported by the Air Research and Development Command on behalf of the Department of Defense and in cooperation with the Army and Navy. Copies of the current report are available to Defense contractors or subcontractors from the Titanium Metallurgical Laboratory at Battelle. Others may purchase copies from the Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C.

THORIUM NITRATE PURIFIED

As part of an Atomic Energy Commission program for production of pure thorium metal, pilot-plant work on the purification of thorium nitrate was undertaken by Battelle in 1952. The investigation involved the production of high-purity thorium nitrate by solvent extraction of an aqueous solution of mantle-grade thorium nitrate. The primary objective of the program was to provide urgently needed basic process design data for a planned semiworks plant. Also desired was enough thorium nitrate produced by solvent extraction with tributyl phosphate to permit analysis of impurities.

The studies required to provide the desired data were described in a paper by Dennis D. Foley and Robert B. Filbert, Jr., which was presented before the American Chemical Society recently. They reported that the pilot-plant installation consisted of three 10-stage mixer-settler units with suitable tanks and pumps for the preparation and storage of the feed and product solutions. The solvent used was a nominal 30

volume per cent solution of tributyl phosphate in an aromatic solvent.

Some of the points that were to be established included (1) the product purity that could be obtained; (2) the thorium recovery to be expected; (3) the approximate number of stages needed in the extracting, scrubbing, and stripping sections; and (4) an operable flow sheet for the process in terms of concentrations and the organic to aqueous flow ratios.

During a continuous 26-hour test period at steady-state conditions, the average production of thorium in the form of a purified aqueous thorium nitrate solution was 2.56 kilograms per hour. The over-all thorium recovery was 99.89 per cent, which was in essential agreement with the tentative specifications set by A.E.C. The resulting aqueous product was of purity necessary for production of thorium metal for atomic energy purposes.

* COMPUTERS FOR ROAD BUILDERS

Experience has indicated that automatic digital computers may be used for quickly solving engineering problems related to highway construction, according to J. James Stone, Jr., chief of Battelle's systems engineering division. He points out that the engineering and design work that must precede ground breaking is likely to be a more important factor in slowing the nation's highway program than actual physical construction. As a means of making more generally available the techniques for utilizing computers for the solution of such problems, Battelle recently organized a Workshop on Highway Engineering Applications of Automatic Computers.

In connection with the workshop, members of the Battelle staff, assisted by representatives of The Ohio State University, Photronix, Incorporated, and the State of Ohio Highway Department, demonstrated the use of computers to solve such problems as cut-and-fill, right-of-way, geometrics, and pier stress analysis.

* Frederick W. Fink has been named chief of Battelle's corrosion research division. Since joining the Institute he has participated in a wide range of corrosion studies; but with special emphasis on corrosion of nonferrous metals and stainless steels. Fink is chairman of the education symposium planned for the 1958 annual meeting of the National Association of Corrosion Engineers. He was chairman of the Gordon Conference on Corrosion in 1951, and in 1952-53 he was chairman of the corrosion division of the Electrochemical Society.

Writings by STAFF Members

Journal of Metals, v. 9, sec. 2; *American Institute of Mining, Metallurgical and Petroleum Engineers, Transactions*, v. 209, July 1957, contains the following articles by staff members:

Hydrogen Distribution in Heat-Treated Titanium as Established by Autoradiography. O. J. Huber, J. E. Gates, A. P. Young, M. Pobereskin, and P. D. Frost, pp. 918-923.
The duplex heat treatment of the two-phase Ti alloys containing relatively large amounts of β-stabilizing elements frequently produces a dark-etching phase at the grain boundaries. An investigation of this phase was conducted on an alloy containing Ti-3% Mn-1% Fe-1% Cr-1% Mo-1% V in the annealed and in the heat-treated condition. Autoradiography, using tritium as a tracer element, and electron microscopy showed the intergranular phase to be a hydrogen-rich material.

Constitution of Delta-Phase Alloys of the System U-Zr-Ti. H. A. Saller, F. A. Rough, A. A. Bauer, and J. R. Doig, pp. 878-881.
The ternary section between the intermediate δ-phase alloys of the U-Zr and U-Ti systems was investigated and a constitutional diagram for the section, ranging from U-74 atomic per cent Zr to U-35 atomic per cent Ti was proposed. No evidence for a three-phase region or a new phase not found in the binary systems was indicated. At elevated temperatures the three components exhibited complete solubility, to form the body-centered-cubic γ-phase, decomposing at about 560 C to the U-Zr and U-Ti δ phases in an apparent eutectoid reaction.

Calculation of Diffusion Coefficients by the Metano-Boltzmann Method. E. M. Baroody, pp. 819-822.
Some aspects of Boltzmann's solution for one-dimensional diffusion in an infinite medium when the initial distribution is a step function are clarified. The basis of the Metano-Boltzmann method for determining diffusion coefficients from concentration curves is discussed, and a new way of applying the method is derived and illustrated. The new procedure makes the judgment of the effect of errors in concentration measurements easier than do the graphical methods frequently used.

How To Use Your Stack "Pump". R. B. Engdahl and Auburn Smith. *Power*, v. 101, August 1957, pp. 106-107.
Chimneys are pictured as "pumps" which pump air to the boilers and move combustion gas away. The stack pumps when the gas column weighs less than an equivalent outside imaginary air column. Stack friction, and hence size, is important because it decides how much air will flow. Too small a cross-section results in too high a friction loss, so that the stack will either fail to supply enough combustion air or spill some of the combustion products into the building.

V_2O_5-Opacified White Enamels. A. K. Smalley, B. W. King, and W. H. Duckworth. *American Ceramic Society, Journal*, v. 40, August 1957, pp. 253-255.
Whiteness and opacity were developed in lead borosilicate enamels by additions of three to eight weight per cent of V_2O_5. Compositions were adjusted to provide fit and adherence to both glass and aluminum. Some of the experimental enamels for glass had marginal resistance to hot alkali solutions. The enamels for aluminum, for which acid and weather resistance are desirable, were rated as having class A acid resistance.

Technology for Casting Titanium. G. H. Schippereit, R. M. Lang, and J. G. Kura. *Modern Castings*, v. 32, August 1957, pp. 33-48.

This comprehensive report on the progress of research on Ti casting deals with several types of melting furnaces, molding materials and processes, properties of alloys, casting design, and potential markets for the next decade.

Dislocations and Stacking Faults in Stainless Steel. M. J. Whelan, P. B. Hirsch, R. W. Horne, and W. Bollmann. *Royal Society, Proceedings*, v. 240, ser. A, July 16, 1957, pp. 524-538. 12 plates.

Experiments with transmission electron microscopy show clearly that the dislocations in stainless steel can split into partial dislocations, and the existence of such partials and of stacking faults in face-centered cubic metal is confirmed. The stacking-fault energy is found to be low, and the properties of the dislocations and of the metal are as expected from a metal of low stacking-fault energy.

"Electron Microscopy. Proceedings of the Stockholm Conference, September 1956", 1957, Academic Press Inc., New York, contains the following writings by staff members:

Dislocations in Stainless Steel. W. Bollmann, pp. 316-318. Stacking faults and other dislocations in 18 per cent Cr-8 per cent steel are examined by transmission electron microscopy of their crystal foils.

Electron-Microscopical Investigations of Calcium Hydroxide and Calcium Carbonate. G. Schimmel, pp. 347-348.

Calcium hydroxide precipitates from aqueous solution in the form of smooth, compact spherulites. On intensive irradiation the precipitate changed from an amorphous to a crystalline state, and $CaCO_3$ in a calcite structure was identified.

Problems in Nuclear Engineering, v. I. Pergamon Press, 1957 contains the following writings by staff members:

Diffusion of Uranium Through Graphite. L. D. Loch, J. R. Gambino, and W. H. Duckworth, pp. 145-150.

Diffusion rates were determined in the temperature range 3000 to 4350 F. The observations indicated two distinct types of uranium transport which could be associated with volume diffusion and with migration along pores. To estimate the practical importance of pore migration, the uranium flow through a graphite wall at 3000 F was measuerd. With a wall thickness of 0.32 cm, the average flow per unit area was 0.015 mg. per cm^2. per hour for a 40 hour test.

Hydrogen-Uranium Phase Diagrams. M. W. Mallett and M. J. Trzeciak. pp. 168-169.

Phase diagrams were constructed for the hydrogen-uranium system. Recent solubility data were used to prepare diagrams based on terminal solubilities and solubilities at one atmosphere hydrogen pressure.

The Strengthening of Thorium by Alloying, Heat Treatment, and Cold Work. H. R. Ogden, R. M. Goldhoff, and R. I. Jaffee, pp. 200-206.

Carbon, as an impurity element, was shown to be the chief contributor to the strength differential between bomb-reduced and high-purity thorium. Thorium-carbon alloys can be heat-treated to high strength levels by a precipitation-hardening process and by cold working. Combinations of cold working followed by aging provide optimum properties in thorium-carbon alloys.

Members of the Battelle staff are authors of the recently published articles and books listed on these pages. In most cases, reprints are available from the Battelle Publications Office, 505 King Avenue, Columbus 1, Ohio.

Transactions of American Society for Metals. v. XLIX, 1957, contains the following papers by staff members:

The Effect of Sulphur on the Properties of Titanium and Titanium Alloys. L. W. Berger, D. N. Williams, and R. I. Jaffee, pp. 300-314.

Additions of up to 0.025 weight per cent sulphur to titanium resulted in increased tensile strength and decreased ductility. Further additions of sulphur, up to 0.45 weight per cent, had little effect on tensile properties. Very small additions of sulphur effectively refined the grain size of titanium and titanium alloys, both in the as-cast and as-wrought conditions.

The Mechanical Properties of Swaged Iodide-Base Chromium and Chromium Alloys. D. J. Maykuth and R. I. Jaffee, pp. 948-958.

Swaged iodide chromium with a fibrous structure and tested as a round bar shows excellent tensile ductility which is lost after the material has been recrystallized. The modulus of elasticity of chromium decreases from a value of 42,000,000 psi at room temperature to 36,000,000 psi at 800° C.

A Study of the Air Contamination of Three Titanium Alloys. J. E. Reynolds, H. R. Ogden, and R. I. Jaffee, pp. 280-299.

The air contamination of commercial titanium, Ti-5Al-2.5Sn, and Ti-4Al-4Mn alloys has been studied over a temperature range of 815 to 1149 degrees C. A Van Ostrand-Dewey diffusion analysis was applied to hardness-penetration curves, and diffusion coefficients associated with the contamination process were calculated.

Density and Viscosity of Titanium Tetrabromide. John M. Blocher, Jr., Robert F. Rolsten, and I. E. Campbell. *Electrochemical Society, Journal*, v. 104, September, 1957, pp. 553-555.

Measurements were made of the density and viscosity of liquid $TiBr_4$. Measurements of the vapor density at the boiling point indicate that $TiBr_4$ is monomolecular.

Historical Perspectives in Twentieth Century Chemistry. Jack J. Bulloff. *Journal of Chemical Education*, v. 34, September 1957, pp. 452-454.

Twentieth century chemistry is yet to experience its greatest expansion. The electronic-nuclear period is well developed and gives chemistry today a powerful and useful system of chemical thought. The second industrial revolution greatly increases the productivity of research. New basic ideas of the first rank cannot occur within the now-completed framework of chemical physics. Such ideas are not being inspired in chemistry by the new directions in modern physics; they must come from an advance in an area of science outside of quantum chemistry.

The Independent Research Organization and the Biological Sciences. Frank C. Croxton. *A.I.B.S. Bulletin*, v. 7, no. 2, April 1957, pp. 13-15.

Availability of diversified, well-equipped research facilities and of specialists in all the physical and engineering sciences makes independent research organizations such as Battelle ideal centers of biological research, particularly in the development of instruments, methods, and materials for medical research and clinical pathology.

Crack Pattern in Chromium Plate, and Wear of Gravure Cylinders. James M. Dugan. *Gravure*, v. 3, July 1957, pp. 18-19.

The presence of the cracks in chromium plate constitutes a problem in the wear of gravure cylinders. Several steps may be taken to reduce the possibility of such wear, but all of these have some disadvantage in the gravure operation. Probably the best solution is substitution of an alloy plating such as Lustralite 10.

Apparatus For Continuous Measurement of the Nitrifying Capacity of Nitrifying Acids. **Gerät zur kontinuierlichen Messung des Nitriervermogens von Nitriersauren.** H. Krupp and W. Letschert. *Chemie-Ingenieur-Technik*, v. 29, August 1957, pp. 517-519.

A new apparatus is described which measures the thermal gradients occurring in the reaction between nitrifying acid and benzol, and thus continuously determines the nitrifying capacity of the acids.

WORLD-WIDE ABSTRACTS

in the FIELDS of

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BATTELLE Technical Review ABSTRACTS

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***Asterisks mark items that may be used in the Battelle Library only. None of the unbound materials listed below are available for interlibrary loan.**

AERONAUTICAL ENGINEERING

15567 Airplane Design Implications of the Inertia Coupling Problem. R. Richard Heppe and Leo Celniker. *Aeronautical Engineering Review*, v. 16, Sept. 1957, p. 69-74.

15568 Research Equipment for Investigation of Aircraft Structure at Elevated Temperatures. J. Taylor. *Aircraft Engineering*, v. 29, Aug. 1957, p. 228 + 4 pages.

Methods and equipment for determining the effects of kinetic heating of aircraft structures.

15569* (English.) **Studies of a Minimum Orbital Unmanned Satellite of the Earth (MOUSE). III. Radiation Equilibrium and Temperature.** D. T. Goldman and S. F. Singer. *Astronautica Acta*, v. 3, no. 2, 1957, p. 110-129.

Presents the problem of predicting the equilibrium temperature of an artificial earth satellite and methods for designing and controlling its temperature under all types of conditions. The results for the equilibrium temperature are presented in the form of convenient nomograms to aid in preliminary design.

15570 Research and Development Technical Handbook 1957-1958. Randolph Hawthorne, editor. *Aviation Age*, v. 1, sections individually paged.

System engineering; aerodynamics and structures; propulsion; aviation electronics; accessory systems; materials; production engineering; testing; computers and data processing; flight operations; ground services and maintenance engineering.

15571 The Stability of Bodies of Revolution at Very High Mach Numbers. A. F. Charwat. *Jet Propulsion*, v. 27, Aug. 1957, p. 866-871.

Dynamic stability of several typical bodies were studied to show the controlling elements of the stability problem.

15572 Flutter of Rectangular Simply Supported Panels at High Supersonic Speeds. John M. Hedgepeth. *Journal of the Aeronautical Sciences*, v. 24, Aug. 1957, p. 563 + 11 pages.

15573 Fixing Boundary-Layer Transition on Supersonic Wind-Tunnel Models. Marvin Luther. *Journal of the Aeronautical Sciences*, v. 24, Aug. 1957, p. 579-586.

Data show the effect on boundary-layer transition of adding single-element or distributed roughnesses near the tips of cone-ogive-cylinder models, using roughness height, cone angle, ogival radius, Mach number, and Reynolds number as variables.

15574 Effects of Leading-Edge Separation on Thin Wings in Two-Dimensional Incompressible Flow. L. F. Crabtree. *Journal of the Aeronautical Sciences*, v. 24, Aug. 1957, p. 597-604.

The flow over an airfoil with a laminar separation bubble near the leading edge is treated.

15575 A Simple Model Study of Transient Temperature and Thermal Stress Distribution Due to Aerodynamic Heating. Gabriel Isakson. *Journal of the Aeronautical Sciences*, v. 24, Aug. 1957, p. 611-619.

15576 Luminescent Gas Flow Visualization for Low Density Wind Tunnels. W. B. Kunkel and F. C. Hurlbut. *Journal of Applied Physics*, v. 28, Aug. 1957, p. 827-835.

On the basis of recent tests the range of practicability of the enriched air glow techniques was found to extend from Mach 2 to Mach 4. The A and He glows were found to be useful in the range Mach 1.3 to Mach 2. Discussion of the ranges of applicability and of other aspects of the observed glows is supported by representative glow photographs.

15577 The Hilbert Problem for an Airfoil in Unsteady Flow. Patrick Leehey. *Journal of Mathematics and Mechanics*, v. 6, July 1957, p. 427-453.

Kelvin's circulation theorem is employed to relate the wake vortex distribution to prescribed vertical motions of the airfoil. General lift and pitching moment expressions are obtained and applied to special cases of a step change in angle of attack, a translatory oscillation, and that of an airfoil in an oscillating moving stream.

15578* (German.) Multiple-Track Tape Recorders in Air Traffic Control. **Die Mehrspur-Magnetbandgeräte im Flugsicherungsdienst.** Kurt Heidelauf. *NTZ; Nachrichtentechnische Zeitschrift*, v. 10, July 1957, p. 344-348.

Fundamental aspects for technical design of the equipment are described by way of an example of a multiple-track magnetic tape recorder used in ATC.

15579 Methods of Interferometry Applied to the Visualization of Flows in Wind Tunnels. R. Chevalerias, Y. Latron, and C. Veret. *Optical Society of America, Journal*, v. 47, Aug. 1957, p. 703-706.

The interferential schlieren apparatus permits a quantitative analysis as precise as that provided by separated beams interferometry, but with a simpler equipment which is easier to handle, less sensitive to external vibrations, and less expensive.

15580* (Russian.) Wings of Minimum Resistance. **Kryl'ia minimal'nogo soprotivleniia.** Iu. L. Zhilin. *Prikladnaia Matematika i Mekhanika*, v. 21, no. 2, Mar.-Apr. 1957, p. 213-220.

The potential of disturbing velocity of the minimum-drag wing on the characteristic back surface conforms with the Laplace equation with mixed marginal conditions. The problem of minimum resistance of a material with a fixed terminal value is solved.

15581 (French.) Methods of Dynamic and Thermal Investigation and Study of the Laminar Compressible Boundary Layer of the Flat Plate. **Méthodes d'exploration dynamique et thermique et étude de la Couche-Limite laminaire compressible de la plaque plane.** Max Plan. *Publications Scientifigues et Techniques du Ministère de l'Air*, 1957, no. 331, 123 p. (TL502 F84.1p Vis.)

Variations of the physical properties of the fluid. Calculation of the laminar compressible boundary layer. Survey of previous tests. Experimental apparatus. Dynamic and thermal investigations. Effect of the leading edge. Dislocation of the laminar layer.

15582* **A Jet Deflected From the Lower Surface of an Aerofoil.** H. J. Davies and A. J. Ross. *Quarterly Journal of Mechanics and Applied Mathematics*, v. 10, Aug. 1957, p. 291-301.

The two-dimensional, steady motion of an infinite, perfect, incompressible fluid past a thin symmetrical aerofoil at zero incidence to the mainstream is considered when a jet issues from a general point on the lower surface of the aerofoil at an angle to the chord.

15583 Some Comments on High-Lift Testing in Wind Tunnels With Particular Reference to Jet-Blowing Models. A. Anscombe and J. Williams. *Royal Aeronautical Society, Journal*, v. 61, Aug. 1957, p. 529-540.

Comments on suitable size of model, methods of feeding compressed air into models without affecting balance readings, and general test technique.

15584* **The Space Encyclopedia.** M. T. Bizony and R. Griffin, editors. 287 p. 1957. Artemis Press, London. (QB14 Sp11 Ref.)

A guide to the nomenclature of astronomy and space research.

15585 Preliminary Investigation of the Characteristics of a Two-Dimensional Wing and Propeller With the Propeller Plane of Rotation in the Wing-Chord Plane. David H. Hickey. *U. S. National Advisory Committee for Aeronautics, Research Memorandum* RM A57F03, Aug. 1957, 12 p. (TL782 Un3rm Vis.)

Model simplicity and the question of valid wind-tunnel blockage corrections limit the test results to a qualitative evaluation. Propeller operation in wind was limited by propeller blade breakage, thus indicating that propeller stresses for this type of operation may be prohibitive.

15586 The Minimization of Wave Drag for Wings and Bodies With Given Base Area or Volume. Max A. Heaslet. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3289, July 1957, 28 p. (TL570 Un3t)

For given base area, general formulas are found that cover as special cases quasi-cylindrical bodies of revolution, wings having plan forms with fore and aft symmetry, slender bodies, and certain classes of yawed wings. For given volume, minimization of the external wave drag of a ducted body of revolution of arbitrary radius is achieved in closed analytic form.

15587 The Subsonic Static Aerodynamic Characteristics of an Airplane Model Having a Triangular Wing of Aspect Ratio 3. II. Lateral and Directional Characteristics. Howard F. Savage and Bruce E. Tinling. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4042, Aug. 1957, 82 p. (TL570 Un3t)

The directional stability for a given tail volume was greater for the mid-wing than for the high-wing configuration because of more favorable wing-tail interference. Differential deflection of the two halves of the horizontal tail to provide lateral control was found to be relatively ineffective.

15588 Review and Investigation of Unsatisfactory Control Characteristics Involving Instability of Pilot-Airplane Combination and Methods for Predicting These Difficulties From Ground Tests. William H. Phillips, B. Porter Brown, and James T. Matthews, Jr. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4064, Aug. 1957, 57 p. (TL570 Un3t)

15589 Effects of Blade Plan Form on Free-Space Oscillating Pressures Near Propellers at Flight Mach Numbers to 0.72. Max C. Kurbjun. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4068, Aug. 1957, 20 p. (TL570 Un3t)

The tapered-blade propeller produced lower sound-pressure levels than the rectangular-blade propeller for the low blade-passage harmonics, frequencies where structural considerations are important and produced higher sound-pressure levels for the higher blade-passage harmonics, and frequencies where passenger comfort is important.

15590 Flight-Test Investigation on the Langley Control-Line Facility of a Model of a Propeller-Driven Tail-Sitter-Type Vertical-Take-Off Airplane With Delta Wing During Rapid Transitions. Robert O. Schade. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4070, Aug. 1957, 19 p. (TL570 Un3t)

Rapid transitions from hovering flight to forward flight could be performed fairly easily, but precise longitudinal control was necessary to perform the transitions smoothly. The transitions from forward flight to hovering flight were more difficult to perform because there was a greater variation of power settings which require closer coordination of the power and pitch control.

15591* **'Hot Airplane' Requires Design Ingenuity for Proper Use of High Strength Steel Alloys.** Alf F. Ensrud. *Western Metals*, v. 15, Aug. 1957, p. 51-54.

Selection of materials and choice of more suitable structural configurations, will alleviate weight penalties of high density alloys at elevated temperatures. Efficient stabilization of compression panels subjected to thermal environment is pointed out.

See also: **16050** (electrical flight - control system); **16061** (control of wind tunnel); **16062** (fire-control computers); **16069** (missile flight control systems); **16072** (air traffic control simulator); **16164** (satellite tracking system); **16238** (hypersonic flow of theoretical gas around bodies); **16330** (liquid rocket propellants); **16448** (steel sandwich structure for aircraft).

AGRICULTURE

15592* **A New Instrument for Measuring the Sorptive Capacities of Various Pesticide Carriers.** J. W. Moore, et al. *Agricultural Chemicals*, v. 12, Sept. 1957, p. 51 + 3 pages.

The principle of its operation is based on the decided alteration in flow characteristics a carrier exhibits at its saturation point. Other applications are suggested. Correctly used, this device should be an important tool for both manufacturers and formulators for control and evaluation work.

15593 Grain Drying by Heat Pump. A. M. Flikke, H. A. Cloud, and A. Hustrulid. *Agricultural Engineering*, v. 38, Aug. Aug. 1957, p. 592-597.

Description of method and economic factors involved.

15594* **Use of Artificial Light in Horticulture.** R. H. Stoughton and Daphne Vince. *Agricultural Review*, v. 3, Aug. 1957, p. 8-15.

Light sources to supplement daylight for plant growth involve a consideration of two main factors, namely, the kind or type of light source and the economics of its employment.

15595* **An Analysis of Growth and of Form in Young Apple Trees. I. Relative Growth and Net Assimilation Rates in 1- and 2-Year-Old Trees of the Apple Rootstock-Variety M.XIII.** M. C. Vyvyan. *Annals of Botany*, v. 21, new ser., July 1957, p. 479-497.

15596* **Report on Phosphorus in Fertilizers. I. Preparation of Solution of Sample for Total Phosphorus Determination.** K. D. Jacob and W. M. Hoffman. **II. Photometric Determination of Phosphorus.** E. A. Epps, Jr. and K. D. Jacob. **III. Mechanical Analysis of Phosphate Rock.** K. D. Jacob and W. M. Hoffman. *Association of Official Agricultural Chemists, Journal*, v. 40, Aug. 1957, p. 690-722.

15597* Effect of Insecticides and Herbicides Applied to Soil on the Development of Plant Diseases. I. The Seedling Disease of Barley Caused by *Helminthosporium Satirum* P. K. & B. Lloyd T. Richardson. *Canadian Journal of Plant Science*, v. 37, July 1957, p. 196-204 + 2 plates.

When nine insecticides and ten herbicides were applied at a series of dosages to soil infested to various degrees, it was found possible to separate these chemicals into four groups on the basis of their effects on seedlings and on the development of rootrot infection.

15598* The Influence of Combined Nitrogen on Nodulation and Nitrogen Fixation by *Rhizobium Meliloti* Dangeard. D. A. Richardson, D. C. Jordan, and E. H. Garrard. *Canadian Journal of Plant Science*, v. 37, July 1957, p. 205-214.

High nitrate concentrations inhibited nodulation to a greater extent than high ammonium concentrations. A small amount of combined N appeared to promote nodulation.

15599* DDT and DDD Residues on Tomatoes Processed Into Juice. L. A. Miller, J. R. W. Miles, and W. W. Sans. *Canadian Journal of Plant Science*, v. 37, July 1957, p. 288-291.

Approximately 80% of the residues were removed during washing and most of the remainder was concentrated in the waste.

15600* (German.) The Significance of Magnesia Fertilizers. **Die Bedeutung der Magnesia-Düngung.** Theodor Schmidt. *Chemiker-Zeitung*, v. 81, July 20, 1957, p. 455-456.

Importance of Mg to plants; solubility of various Mg-containing fertilizer ingredients.

15601 Surfactants in Fertilizers. E. J. Fox and W. A. Jackson. *Journal of Agricultural and Food Chemistry*, v. 5, Aug. 1957, p. 578-583.

Anionic surfactants were more readily adsorbed on acidic surfaces, while cationic surfactants were more readily adsorbed on basic materials. Acidic surfaces were made hydrophilic by the anionic surfactants and hydrophobic by cationic surfactants. The results were reversed in the case of basic materials.

15602 Effectiveness of 4,4' - Dichloro - Alpha -(Trichloromethyl) Benzhydrol (FW-293) for Control of Citrus Mites in California. L. R. Jeppson, H. S. Elmer, M. J. Jesser, and J. O. Complin. *Journal of Agricultural and Food Chemistry*, v. 5, Aug. 1957, p. 592-595.

In 16 southern California citrus groves, FW-293 was found to be effective in controlling the citrus red mite, and the citrus flat mite, but was not so effective as petroleum oil (light-medium grade) or Chlorobenzilate in controlling the citrus bud mite.

15603 Field Persistence of the Acaricide 4,4'-Dichloro-Alpha-(Trichloromethyl)-Benzhydrol (FW-293) on and in Mature Lemons and Oranges. F. A. Gunther, et al. *Journal of Agricultural and Food Chemistry*, v. 5, Aug. 1957, p. 595-598.

Negligible amounts of FW-293 were found in edible portions of the fruit. The peel retained approximately 30% of its residues after being processed into dried citrus cattle feed.

15604 Fungicidal Activity of Trichloromethyl Thiolsulfonates. Thomas P. Johnston, Walter H. C. Rueggerberg, and Seymour S. Block. *Journal of Agricultural and Food Chemistry*, v. 5, Sept. 1957, p. 672-674.

15605 Fertilizer Technology. Production of Ordinary Superphosphate for Immediate Use in Ammoniation and Granulation Processes. R. D. Young and F. G. Heil. *Journal of Agricultural and Food Chemistry*, v. 5, Sept. 1957, p. 682-687.

Small-scale tests of the reaction of phosphate rock with H_2SO_4 resulted in the identification of conditions that yielded superphosphate of high P_2O_5 availability and of such physical condition that it could be ammoniated about 1 hr. after mixing.

15606 Adsorption of DDT, Methoxychlor and Some Related Compounds on Insecticide Dust Diluents and Carriers. Donald E. Weidhaas. *Journal of Economic Entomology*, v. 50, Aug. 1957, p. 429-435.

Variations in the amount of the various insecticides and related compounds adsorbed by a given diluent or carrier is discussed on the basis of the structure of the organic adsorbate.

15607 Some Chemical and Biological Experiments With Thiodan. Donald A. Lindquist and Paul A. Dahm. *Journal of Economic Entomology*, v. 50, Aug. 1957, p. 483-486.

In tests against female house flies, from a non-resistant strain, the estimated LD_{50} values were: Thiodan—0.15, isomer A—0.14, isomer B—0.19, and DDT—0.21 μg./fly.

15608* Trials With Monuron for Weed Control in Some Direct-Sown Vegetable Crops. H. A. Roberts. *Journal of Horticultural Science*, v. 32, July 1957, p. 142-148.

Summary of field trials carried out during 1953-1954.

15609* Molybdenum as a Plant Nutrient. IX. The Effects of Different Molybdenum and Manganese Supplies on Yield and on the Uptake and Distribution of Molybdenum in Tomato Plants Grown in Sand Culture. M. I. Candela and E. J. Hewitt. *Journal of Horticultural Science*, v. 32, July 1957, p. 149-161.

15610 Studies on Organic Fluorine Compounds. VIII. *N*-Substituted Fluoroacetamides as Insecticides and Rodenticides. Ernst D. Bergmann, P. Moses, and M. Neeman. *Journal of the Science of Food and Agriculture*, v. 8, July 1957, p. 400-404.

15611* The Effect of Gibberellin Upon Flower Formation. Anton Lang. *National Academy of Sciences of the United States of America, Proceedings*, v. 43, Aug. 1957, p. 709-717.

Gibberellin-like materials play a part in the processes of flower formation but they probably function in conjunction with other factors and their effect may be secondary.

15612 An Effect of *p*H on the Uptake of Salt by Plant Cells. R. G. Hurd and J. F. Sutcliffe. *Nature*, v. 180, Aug. 3, 1957, p. 233-235.

15613 Summary of Certain Trends in Soil-Plant Relationship Studies of the Biological Availability of Fall-Out Debris. H. Nishita and K. H. Larson. *University of California at Los Angeles, School of Medicine (U. S. Atomic Energy Commission)*, UCLA 401, July 1957, 68 p. (UF767 Un3.1uc Contin.)

A summary of the data obtained by the investigators of Radio-Ecology Division, UCLA Atomic Energy Project, pertaining to radioactive fall-out and to soil and plant factors that may influence the accumulation of fission products in animals.

15614 The Use of 2,4,5-T and Related Weedkillers. G. Linden. *World Crops*, v. 9, Aug. 1957, p. 325-327.

Large-scale developments in forestry, such as the clearing and replanting of scrubland, have only become practicable by the use of 2,4,5-trichlorophenoxy acetic acid to control stump sprouting. Gorse has also been controlled by this chemical.

15615 The Substituted Urea Herbicides. A. L. Abel. *World Crops*, v. 9, Aug. 1957, p. 328-330.

Properties and uses of Fenuron, Diuron, Monuron, and Neburon.

15616 Trace Elements in Plant Nutrition. II. T. Wallace. *World Crops*, v. 9, Aug. 1957, p. 343-345.

Soil factors which affect the availability of trace elements to plants; correction of deficiencies and excesses.

See also: **15626** (antimicrobial substances in plants); **15785** (analysis of thiophosphate insecticides); **15787** (determination of Cyclethrin insecticides); **15789** (identification of Systox secondary metabolite in cotton).

BIOCHEMISTRY AND BIOPHYSICS

15617 Polypeptides. XV. Infrared Spectroscopy and the Kinetics of the Synthesis of Polypeptides: Primary Amine Initiated Reactions. M. Idelson and E. R. Blout. **XVI. The Polydispersity and Configuration of Low Molecular Weight Poly-γ-Benzyl-L-Glutamates.** J. C. Mitchell, A. E. Woodward, and Paul Doty. **XVII. A Study of the Kinetics of the Primary Amine-Initiated Polymerization of N-Carboxy-Anhydrides With Special Reference to Configurational and**

Stereochemical Effects. R. D. Lundberg and Paul Doty. *American Chemical Society, Journal*, v. 79, Aug. 5, 1957, p. 3948-3972.

15618 Long-Acting Testosterone Esters. Some Considerations on Their Biological Utilization. David Gould, et al. *American Chemical Society, Journal*, v. 79, Aug. 20, 1957, p. 4472-4475.

A series of testosterone 17-esters was prepared to find those with the best activity and duration. Several potent derivatives were found, including the entire family of aryloxyalkanoates.

15619 Bottromycin. I. A New Sulfur-Containing Antibiotic. II. Preliminary Degradation Studies. J. M. Waisvisz, et al. *American Chemical Society, Journal*, v. 79, Aug. 20, 1957, p. 4520-4524.

This new antibiotic was isolated from fermentation broth by solvent extraction and purified either by chromatography on Florisil or by means of its salts with organic acids. On the basis of analysis of bottromycin and its crystalline derivatives, the antibiotic has been assigned an empirical formula $C_{38}H_{57-61}N_7O_{7-8}S$. Bottromycin is cleaved by vigorous acid hydrolysis into six ninhydrin-position substances, two of which have been identified as glycine and valine. Two of the four unidentified fragments were isolated and shown to have the formulas $C_6H_8N_2O_2S$ and $C_{10}H_{12}NO2$. Acetylation of the antibiotic yielded two crystalline ninhydrin-negative compounds $C_{19}H_{22}N_3O_4S$ and probably $C_{21}H_{24}N_4O_4$.

15620* Use of Radioactive Culture Media. Gilbert V. Levin, Venton R. Harrison, and Walter C. Hess. *American Water Works Association, Journal*, v. 49, Aug. 1957, p. 1069-1076.

The rapid method for the presumptive determination of coliform organisms has been considerably refined. The principal changes have been in the development of a compact culture and CO_2 trapping unit, and the reduction in the quantity of isotope used per test.

15621 Infrared Spectra of 3-Phenyl-2-Thiohydantoins of Amino Acids. Agnes Epp. *Analytical Chemistry*, v. 29, Sept. 1957, p. 1283-1287.

The spectra of some preparations deviate from the characteristic phenylthiohydantoin absorption pattern. For these compounds the open-chain thiocarbamyl structure is assumed. The spectra are highly characteristic and serve to identify the amino acids from which they are derived.

15622* (German.) Microbiological Conversions of Steroids for Commercial Purposes. **Mikrobiologische Umwandlungen von Steroiden für technische Zwecke.** E. Vischer and A. Wettstein. *Angewandte Chemie*, v. 69, July 15, 1957, p. 456-463.

For microbiological reaction the dissolved steroid is added to the culture of the respective microorganism; after the proper incubation-period the converted steroids are extracted and isolated; this is achieved either directly or, when by-products have formed, by means of countercurrent distribution or chromatography. For commercial purposes the hydroxylation in 11 α-, 11 β- and 21-position, the 1,2-dehydrogenation, as well as the splitting up of side chains are used with preference.

15623 Annual Review of Biochemistry. J. Murray Luck, Frank W. Allen, and Gordon Mackinney, editors. v. XXVI. 768 p. 1957. Annual Reviews, Inc., Palo Alto, Calif. (QP501 A78a Vis.)

A collection of 21 papers covering the field of biochemistry.

15624* Production of Viomycin-Like Substance by a *Streptomyces*. Tadashi Arai, Tadashi Nakada, and Masami Suzuki. *Antibiotics & Chemotherapy*, v. 7, Aug. 1957, p. 435-442.

An antibiotic identical with or closely similar to viomycin was isolated. The morphological characteristics of the *Streptomyces* were more stable than the physiological ones, such as carbohydrate utilization and antibiotic production.

15625* The Effect of Medium Constituents on Penicillin Production From Natural Materials. Bijoy K. Bhuyan and Marvin J. Johnson. *Applied Microbiology*, v. 5, July 1957, p. 262-267.

With proper adjustment of the composition of the medium a wide variety of materials may be used as C and N sources in penicillin fermentation.

15626* Antimicrobial Substances in Cereals and Fodder Plants. Artturi I. Virtanen, Pentti K. Hietala, and Örn Wahlroos. *Archives of Biochemistry and Biophysics*, v. 69, July 1957, p. 486-500.

Evidence of the occurrence of low-molecular antifungal factors in plants such as rye, wheat, maize, alfalfa, and red clover and in concentrations in which they inhibit the growth of tested pathogenic fungi, strongly supports the concept that these substances are of importance for the resistance of plants against fungi.

15627* Hydroxylamine and Reactive Acyls. Elsie Wainfan and J. T. Van Bruggen. *Archives of Biochemistry and Biophysics*, v. 70, July 1957, p. 43-48.

Conditions for the selective and complete reactivity of thiol esters with hydroxylamine are described, and conditions hazardous to the successful isolation of hydroxamates are presented.

15628* Electric Birefringence Studies on Two Strains of Tobacco Mosaic Virus. Amos Norman and John A. Field, Jr. *Archives of Biochemistry and Biophysics*, v. 70, July 1957, p. 257-265.

Two strains of TMV that differ markedly in electrophoretic mobility also differ in the magnitude of their electric birefringence. The difference in electric birefringence is due to a difference in the refractive index of the two strains. The magnitude of the electric birefringence is dependent on pH.

15629* Histones From Normal and Malignant Cells. P. F. Davison. *Biochemical Journal*, v. 66, Aug. 1957, p. 703-707.

The proteins soluble at pH 6.5 were examined by chromatography and under electrophoresis. The proteins insoluble at pH 6.5 were separated by chromatography into an acidic and a basic fraction.

15630* Autoradiography With Plant Tissue. W. M. Dugger, Jr. *Botanical Review*, v. 23, June 1957, p. 351-387.

Autoradiography, a technique combining radiochemistry, microtechnique, and photography, offers another method for studying the morphology, physiology, and cytology of plants.

15631* Essential Amino Acids in Microorganisms. F. Reusser, J. F. T. Spencer, and H. R. Sallans. *Canadian Journal of Microbiology*, v. 3, Aug. 1957, p. 721-728.

A rapid quantitative method for amino acid determination using one-dimensional paper chromatography was developed.

15632 The Effect of Streptomycin on the Enzymic Synthesis and Degradation of Carbohydrates. S. A. Barker, E. J. Bourne, M. Stacey, and R. B. Ward. *Chemical Society, Journal*, 1957, July, p. 2994-2998.

Streptomycin decreases the production of fructose from glucose 1-phosphate by *E. coli* and from sucrose by a cell-free extract of *A. niger*. The actions of a transglucosylase and a transgalactosylase of *A. niger* were also retarded.

15633* (Russian.) Role Played by the Polymeric Condition of Ribonucleic Acid in the Renewal of Protein Complexes of Cytoplasmic Structures. **O znachenii polimernogo sostoianiia ribonukleinovoi kisloty dlia obnovleniia belkovykh kompleksov tsitoplazmaticheskikh obrazovanii.** M. P. Pavlova. *Doklady Akademii Nauk SSSR*, v. 114, May 11, 1957, p. 383-386.

Proportion of pentose to the P in ribonucleic acid. Specific activity of P^{32} in a cytoplasmic extract.

15634* Studies on Collagen. II. Cylindrical Lattice Structure of Collagen. V. Sasisekharan and G. N. Ramachandran. *Indian Academy of Sciences, Proceedings*, v. 45, sec. A, June 1957, p. 363-376 + 1 plate.

The protofibrils, consisting of triple chains, are packed together in a hexagonal array close to the center, and are extended outwards in the form of cylindrical sheets. It is shown that the structure can also belong to the roll type with the advantage that the formation of a roll in the form of a continuous sheet is more probable from the point of view of fibrogenesis.

15635 Oxygen Absorption Rates in Shaken Flasks. Michael A. Auro, Howard M. Hodge, and Norman G. Roth. *Industrial and Engineering Chemistry*, v. 49, Aug. 1957, p. 1237-1238.

Only volumes of flask and of solution added are needed to predict conditions that will satisfy aeration requirements of certain microorganisms.

15636* (French.) Central Analgesics. 4-Carbethoxy-4-Phenyl-Piperidine Derivatives. **Analgésiques centraux. Dérivés de la 4-carbéthoxy-4-phényl-pipéridine.** H. Morren and H. Strubbe. *Industrie Chimique Belge*, v. 22, July 1957, p. 795-798.

Preparation and pharmacodynamic properties of a series of 4-carbethoxy-4-phenyl-piperidine derivatives which are substituted at the N atom by a radical which contains an ether function.

15637 Isotopic Tracers in Biology. An Introduction to Tracer Methodology. Martin D. Kamen. 3rd Ed. 474 p. 1957. Academic Press, New York. (QH324 K12r3)

15638 The Methane Fermentations of Acetate and Methanol. Martin J. Pine and Wolf Vishniac. *Journal of Bacteriology*, v. 73, June 1957, p. 736-742.

Methanol fermenting preparations were derived from primary acetate enrichment cultures inoculated with mud from streams. Chlorides substituted for the corresponding sulfate salts in the medium and homogenized asbestos provided a matrix for the organisms.

15639 Probable Absence of Direct Induction of Bacterial Resistance to Streptomycin. Tsutomu Watanabe, Toshio Fukasawa, and Daizo Ushiba. *Journal of Bacteriology*, v. 73, June 1957, p. 770-777.

Found that cells suspended in phosphate buffer (so-called "resting cells") actually die or multiply and that the concurrent development of streptomycin resistance in the presence of the antibiotic is due to spontaneous mutation and selection.

15640* The Metabolism of the Organic Acids of Tobacco Leaves. XIII. Effect of Culture of Excised Leaves in Solutions of Potassium Bicarbonate. Hubert Bradford Vickery and James K. Palmer. *Journal of Biological Chemistry*, v. 227, July 1957, p. 69-81.

The formation of citric acid occurs which is approximately the same as that observed when succinate or fumarate is made available to the leaves from solutions at approximately pH 7.

15641* Corticotropins. XIII. Identification of Certain Peptides in Partial Acid Hydrolysates of α-Corticotropin (α-ACTH). Choh Hao Li, R. David Cole, David Chung, and José Léonis. *Journal of Biological Chemistry*, v. 227, July 1957, p. 207-216.

Peptides containing lysine and arginine derived from the partial acid hydrolysis of α-corticotropin and dinitrophenyl α-corticotropin have been isolated by chromatographic and electrophoretic procedures.

15642* On the Mode of Action of X-Ray Protective Agents. III. The Enzymatic Reduction of Disulfides. Alexander Pihl, Lorentz Eldjarn, and Jon Bremer. *Journal of Biological Chemistry*, v. 227, July 1957, p. 339-345.

The initial rate of disulfide reduction was found to parallel the calculated initial concentration of oxidized glutathione in the reaction mixture, it showed no relation to the concentration of the mixed disulfide.

15643* Histochemical Demonstration of the Sites of Activity of Dehydrogenase Systems With the Electron Microscope. Russell J. Barrnett and George E. Palade. *Journal of Biophysical and Biochemical Cytology*, v. 3, July 1957, p. 577-588 + 7 plates.

Potassium tellurite is used as reagent intravitally or supravitally on small blocks of tissue for the demonstration of endogenous dehydrogenase activity.

15644* Serologic Comparisons With Lines of Influenza Virus Isolated and Serially Transferred in Different Experimental Hosts. Keith E. Jensen, Elva Minuse, and Thomas Francis, Jr. *Journal of Immunology*, v. 78, May 1957, p. 356-364.

Variations in antigenic potency and avidity for antibody were noted especially with viruses after passages in mice or in chorioallantoic membrane tissue culture.

15645 Synthesis of Potential Anticancer Agents. VI. Use of *O*-Benzoyl Blocking Group for Synthesis of 6-Chloropurine Nucleosides. B. R. Baker, Kathleen Hewson, H. Jeanette Thomas, and James A. Johnson, Jr. **VII. Nucleosides Derived From L-Rhamnopyranose. VIII. Nucleosides Derived From L-Rhamnofuranose.** B. R. Baker and Kathleen Hewson. *Journal of Organic Chemistry*, v. 22, Aug. 1957, p. 954-971.

15646 Photosynthesis and Energy Transfer. E. Rabinowitch. *Journal of Physical Chemistry*, v. 61, July 1957, p. 870-878.

15647* (Hungarian.) Synthetic Hypotensives. **Szintétikus vérnyomáscökkentők. I.** Károly Lempert and Károlyné Lempert. *Magyar Kémiai Folyóirat*, v. 63, Feb.-Mar. 1957, p. 84-87.

Review of compounds and their properties.

15648 Molecular Structure and Functional Activity of Nerve Cells. Robert G. Grenell and L. J. Mullins, editors. 169 p. 1956. American Institute of Biological Sciences, Washington, D. C. (QP363 Am35m)

Five papers dealing with chemoreceptor mechanisms, visual receptors as biological transducers, affinity for wool as an indicator of neuropharmacological activity, oxygen utilization in sympathetic ganglia, and structure of nerve cell membranes.

15649 Triphosphopyridine Nucleotide as a Catalyst of Photosynthetic Phosphorylation. Daniel I. Arnon, F. R. Whatley, and M. B. Allen. *Nature*, v. 180, July 27, 1957, p. 182-185.

15650* (German.) Model Tests for the Formation, by Means of Electrical Discharges, of Organic Compounds in Simple Gas Atmospheres. **Modelluntersuchungen zur Bildung organischer Verbindungen in Atmosphären einfacher Gase durch elektrische Entladungen.** Kurt Heyns, Wolfgang Walter, and Ernst Meyer. *Naturwissenschaften*, v. 44, no. 14, 1957, p. 385-389.

Glycine, alanine, sarcosine, β-alanine, and α-aminobutyric acid were obtained from a methane, ammonia, and hydrogen atmosphere by means of electrical discharges in studies of types of reactions that could have taken place in prehistoric atmospheres.

15651* Energy Deposition in Tissue and Similar Materials by 14.1-Mev Neutrons. M. L. Randolph. *Radiation Research*, v. 7, July 1957, p. 47-57.

The value for the energy dissipation per nucleus per unit flux for H, C, N, and O are found to be roughly constant. Applications of these results include determination of dose rate from flux measurements, correction of dose values resulting from ionization measurements in nontissue-equivalent materials, and means of determining tissue equivalence.

15652 Recent Progress in Hormone Research. Gregory Pincus, editor. v. XIII. 646 p. 1957. Academic Press, New York. (QP801.H7 R24 Vis.)

A compilation of 14 papers presented at the Laurentian Hormone Conference 1956.

15653* (Spanish.) Radiations in Biology. **Las radiaciones en biología.** J. Lucas Gallego. *Revista de Ciencia Aplicada*, v. 11, May-June 1957, p. 229-236.

Phenomena caused by radiation. Characteristics of electromagnetic and corpuscular radiations. Decomposition of substances exposed. Biological effects and different types of reaction in cell reproduction.

15654 Some Aspects of the Chemistry and Toxic Action of Organic Compounds Containing Phosphorus and Fluorine. Bernard Charles Saunders. 231 p. 1957. Cambridge University Press, London. (QD412.P1 Sa87s)

15655 The Function of the Donor Tissue in Bone Graft Operations. Marshall R. Urist and N. S. MacDonald. *University of California at Los Angeles, School of Medicine (U. S. Atomic Energy Commission)*, UCLA-400, July 1957, 26 p. (UF767 Un3.1uc Contin.)

The donor tissue was gradually absorbed over a period of 16 weeks. It became attached to the skeleton by a thin layer of cement substance. Microautoradiography of Sr^{90}-labeled bone grafts showed that radioactivity was not transferred locally across the cement line between the donor and the host. Microradiography and microdensitometry studies showed that there was no hypermineralization of the donor tissue.

15656* Degradation of Tobacco Mosaic Virus With Acetic Acid. H. Fraenkel-Conrat. *Virology*, v. 4, Aug. 1957, p. 1-4.

Facilitates the preparation of native virus protein free of nucleic acid.

See also: **15884** (vitamin D series); **16873** (chemical protection from ionizing radiation); **17101** (response of dogs to X-irradiation).

CERAMICS AND CONCRETE

15657 Chemistry and Magnetic Properties of Some Ferrimagnetic Oxides Like Those Occurring in Nature. E. W. Gorter. *Advances in Physics*, v. 6, July 1957, p. 336-361.

Crystal chemistry of the spinel, hematite (ilmenite), and pseudobrookite structures; magnetic structure and crystal structure.

15658 Thoria Ceramics. C. A. Arenberg, H. H. Rice, H. Z. Schofield, and J. H. Handwerk. *American Ceramic Society, Bulletin*, v. 36, Aug. 1957, p. 302-306.

Dense thoria bodies were obtained at relatively low temperatures by the use of small amounts of isomorphic additives.

15659 Sintering of Zircon and Zirconia With the Aid of Certain Additive Oxides. Edmond P. Hyatt, Carl J. Christensen, and Ivan B. Cutler. *American Ceramic Society, Bulletin*, v. 36, Aug. 1957, p. 307-309.

Some oxides promoted low-temperature sintering and other oxides inhibited sintering. Iron oxide improved sintering for both. Thin sections indicated little or no increase in grain size.

15660 V_2O_5-Opacified White Enamels. A. K. Smalley, B. W. King, and W. H. Duckworth. *American Ceramic Society, Journal*, v. 40, Aug. 1957, p. 253-255.

Whiteness and opacity were developed in lead borosilicate enamels by additions of 3 to 8 weight % of V_2O_5. Compositions were adjusted to provide fit and adherence to both glass and Al. Some of the experimental enamels for glass had marginal resistance to hot alkali solutions. The enamels for Al, for which acid and weather resistance are desirable, were rated as having class A acid resistance.

15661 Magnetic Properties and Associated Microstructure of Zinc-Bearing Square-Loop Ferrites. G. G. Palmer, R. W. Johnston, and R. E. Schultz. *American Ceramic Society, Journal*, v. 40, Aug. 1957, p. 256-262.

Zinc oxide was added to square-loop ferrite compositions to obtain a lower coercive force and higher magnetic saturation induction than possible from standard commercial square-loop ferrites. Curie temperatures, hysteresis loops, initial permeabilities, magnetization curves, and switching times for these zinc-bearing square-loop ferrites were determined.

15662 Fundamentals of Glass - to - Metal Bonding. III. Temperature and Pressure Dependence of Wettability of Metals by Glass. Richard M. Fulrath, Stephan P. Mitoff, and Joseph A. Pask. *American Ceramic Society, Journal*, v. 40, Aug. 1957, p. 269-274.

A system was completed that was capable of subjecting test combinations to temperatures up to 1400 C at a working pressure of 10^{-6} mm. of Hg.

15663 Properties of Yttrium Oxide Ceramics. C. E. Curtis. *American Ceramic Society, Journal*, v. 40, Aug. 1957, p. 274-278.

The cubic structure of Y_2O_3 is stable to 1800 C in air as indicated by petrographic, X-ray, and differential thermal analyses. In equimolecular binary mixtures heated in the powdered state at 1500 C, Y_2O_3 formed compounds with Al_2O_3 and Fe_2O_3 and solid solutions with ZrO_2 and HfO_2, but Y_2O_3 did not react with CaO, MgO, or ThO2.

15664* Effect of Tobermorite on the Mechanical Strength of Autoclaved Portland Cement-Silica Mixtures. L. Dean Sanders and W. J. Smothers. *American Concrete Institute, Journal*, v. 29, Aug. 1957, p. 127-139; *ACI Proceedings*, v. 54, 1957, p. 127-139.

Mechanical strength of steam-cured neat portland cement and cement-silica mixtures was evaluated by utilizing metal test fixtures designed to simulate the ceramic and metal parts of a high-tension porcelain insulator. X-ray diffraction analysis was used to identify the crystalline phases present after curing the cement mixtures. Amount of the platy phase of the hydrate tobermorite formed by the steam curing was found to be a definite indication of the mechanical strength of the cement-silica mixtures.

15665 Relationships Between Constitution and Properties of Silica Refractories. I. Effects of the Devitrifying of Silica Glass. A. C. D. Chaklader and A. L. Roberts. *British Ceramic Society, Transactions*, v. 56, July 1957, p. 331-344.

Experiments in which transparent and translucent fused-silica glass were progressively devitrified showed that marked changes in properties occurred when crystals were developed. The modulus of rigidity at 20 C fell to one-third of the normal value when 12% of cristobalite had appeared. Measurements in torsion at high temperatures showed that the viscosity of silica glass greatly increased once crystallization occurred and this is considered to be a major factor with regard to the characteristic strength of silica refractories in service.

15666* (Russian.) A Study of the RbF-FeF_2 Equilibrium Diagram and Its Relation to the BaO-SiO_2 System. **Issledovanie diagrammy sostoianiia sistemy RbF-BeF_2 i ee otnoshenie k sisteme BaO-SiO_2.** R. G. Grebenshchikov. *Doklady Akademii Nauk SSSR*, v. 114, May 11, 1957, p. 316-319.

Equilibrium diagram of the RbF-BeF_2 system based on a differential-thermal method, X-ray phase analysis, and an optical examination of the crystals.

15667* (Russian.) Relation Between the Strength and Stability of Butt Joints and the Type of Cement and Its Additions. **Zavisimost' prochnosti i stoikosti stykovykh soedinenii ot vida tsementa i dobavok.** E. V. Lavrinovich. *Gidrotekhnicheskoe Stroitel'stvo*, v. 26, July 1957, p. 29-32.

Improving the qualities of joints in a prefabricated concrete structure by addition of surface-active substances such as sulfite-alcoholic liquors to various types of cement.

15668* (Czech.) Production of Al_2O_3 by the Desilication Method From Kaolinitic Raw Materials. **Výroba Al_2O_3 desilikační metodou z nebauxitových surovin.** Zdeněk Švejda. *Hutnické Listy*, v. 12, July 1957, p. 657-672.

Principle of this method is in the annealing of raw materials at 950 to 1050 C, in dissolving SiO_2 in a solution of NaOH, and treatment of the residue with the Bayer or combined methods. The solution of NaOH and SiO_2 is regenerated with CaO and after separation of $CaSiO_3$ by filtration is used again.

15669* (French.) Properties of Dolomite-Based Faïence Pastes. **Propriétés des pâtes de faïence à base de dolomie.** C. Deplus. *Industrie Céramique*, 1957, no. 488, July-Aug. p. 222-231.

The faïences studied were composed of silica, alumina, lime, and magnesia, with very little alkaline flux. Flexion, porosity, and dilatation were tested.

15670* (Spanish.) Deformation of Various Types of Refractories When Heated Under Load. **Comportamiento de los diferentes tipos de refractarios, al reblandecimiento en caliente bajo carga.** Eugenio Perez Blanco. *Instituto del Hierro y del Acero*, v. 10, Apr.-June 1957, p. 147-159.

Comparison of various types of hot-load tests. General consideration of the causes of softening. Results on aluminum silicates, siliminite, corundum, magnesite, chromite, and other materials.

15671* (English.) **On the Formation and Constitution of Nickel-Ferrite.** Isao Kushima, Tsuyoshi Amanuma, and Katsuyoshi Tanaka. *Kyoto University, Memoirs of the Faculty of Engineering*, v. 19, no. 2, Apr. 1957, p. 191-206.

15672* (Russian.) Solutions With High Cementing Qualities. **Tsementnye rastvory s vysokimi tamponiruiushchimi svoistvami.** N. I. Titkov and A. I. Berezhnoi. *Neftianoe Khoziaistvo*, v. 30, July 1957, p. 13-18.

To increase the hardening quality of cement used in the petroleum industry, addition of $CaCl_2$ is recommended.

15673 Radiation-Induced Hardness Changes in Graphite. K. E. Horton and R. L. Carter. *Nuclear Science and Engineering*, v. 2, July 1957, p. 513-515.

Changes in Knoop hardness of artificial graphite from the range 9 to 12 to the range 30 to 75 are found to accompany fast neutron irradiation at 30 C.

15674* (Russian.) Investigating the Reaction Medium Which Predisposes the Chrome-Magnesite Lining of a Foundry Furnace to Wear. **Issledovanie reaktsionnoi sredy, obuslovlivaiushchei iznos khromomagnezitovoi futerovki v vel'ts-pechakh.** A. M. Davidson, P. A. Polkvoi, and G. A. Rashin. *Ogneupory*, v. 22, no. 7, 1957, p. 306-312.

Crust found on furnace lining and its components are blamed for decreasing the heat-resisting quality of lining. Physicochemical analysis of crust is given.

15675* (Russian.) The Effect of Certain Additives on Quartz Modifications in the Range of 1400-1600 C. **Vliianie nekotorykh dobavok na modifikatsionnye izmeneniia kvartsa v intervale temperatur 1400°-1600°C.** M. F. Nazarenko and V. L. Razumova. *Ogneupory*, v. 22, no. 7, 1957, p. 318-324.

Addition of Fe^{3+}, Ni^{2+} and Cu^{2+} to β-quartz and their effect on quartz modifications. Appearance of metacristobalite in the range of 1400-1500 C and its transformation to cristobalite at 1600 C.

15676* (English.) **Conical Spiral Structure and Laminar Cleavage of Graphite.** Takuro Tsuzuku. *Physical Society of Japan, Journal*, v. 12, July 1957, p. 778-788.

An apparently circular crystal is really a stack of conical graphite sheets, each of which is successively rotated about the common axis in *c*-direction. Such a conical crystal can be formed by a spiral mechanism. The gliding mechanism connected with the spiral structure is explained in terms of dislocations.

15677* (French.) Pozzolana Cements With High Chemical Resistance and Normal Hardening. Applications to the Production of Fly Ash Cements. **Ciments aux pouzzolanes à haute résistance chimique et durcissement normal. Applications à la fabrication de ciments aux cendres volantes.** P. Fouilloux. *Revue des Matériaux de Construction, C*, 1957, no. 502, July, p. 191-196.

These pozzolanic cements produce mortars and concretes with very high impermeability, low heat of hydration, and satisfactory water penetration behavior.

15678* (French.) Effect of Temperature Reduction on Cement Hardening, Especially in Slag-Based Cements. **Influence de l'abaissement de la température sur le durcissement des ciments tout spécialement des ciments à base de laitiers.** Léon Blondiau. *Revue des Matériaux de Construction, C*, 1957, no. 502, July, p. 203-218.

Results obtained with concrete. Comparison of Portland and blast furnace cements. High strength cements. Over-sulfated cement and H-R-Portland cement. Rapid hardening cements. (To be continued.)

15679 Procedure for Mechanical Tests on Cements. *R.I.L.E.M. International Association of Testing and Research Laboratories for Materials and Structures, Bulletin*, 1957, no. 34, p. 1-9.

The specimens are tested for bending and compressive strengths.

15680* (German.) Structure Tests on Sintered Alumina-Chromium Test Pieces. **Gefügeuntersuchungen an Sinterkörpern aus Tonerde und Chrom.** Werner Schatt. *Silikattechnik*, v. 8, July 1957, p. 268-273.

Influence of grinding time, Cr content, and sintering temperature on structure.

15681* (Russian.) Heat-Resistant Glasses KC-16 and KC-18. **Termostoikie stekla KC-16 i KC-18.** I. I. Kitaigorodskii and N. V. Artamonova. *Steklo i Keramika*, v. 14, no. 7, July 1957, p. 7-8.

Melting method and properties.

15682* (Russian.) Strength of Sintered Corundum. **O prochnosti spechennogo korunda.** N. M. Pavlushkin. *Steklo i Keramika*, v. 14, no. 7, July 1957, p. 14-17.

Experiments determining compressive and bend strength of specimens with regular, polished, and pickled surfaces. The compressive and bend strength of treated corundum is considerably higher than that of corundum with an untreated surface.

15683* (Russian.) Control of Fuel Consumption in Kilns During Firing of Porcelain. **Regulirovanie raskhoda topliva v gornakh pri obzhige farfora.** S. N. Delikishkin. *Steklo i Keramika*, v. 14, no. 7, July 1957, p. 20-22.

Stabilization of combustion process and equalizing heating conditions in entire chamber during total period of firing. Decrease of firing time and increase in productivity without lowering the quality of the product.

15684* (Russian.) Experimental Production of High-Pressure Reinforced Concrete Pipes of Large Diameter. **Opyt izgotovleniia vysokonapornykh zhelezobetonnykh trub bol'shikh diametrov.** I. N. Akhverdov and I. M. Ovadovskii. *Stroitel'naia Promyshlennost'*, v. 35, no. 6, June 1957, p. 6-9.

Technology of the centrifugal method (with vibration) of producing reinforced concrete pipes. Pipes are durable; cost and steel consumption in comparison with metal pipes is considerably lower.

15685 Syllabus of Clay Testing. T. A. Klinefelter and H. P. Hamlin. *U. S. Bureau of Mines Bulletin* 565, 1957, 67 p. (TN21 Un3b)

15686* (English.) **Graphite Whiskers.** Lothar Meyer. *Zeitschrift für Kristallographie*, v. 109, July 1957, p. 61-67.

An especially well developed whisker of 1.3 mm. length and 0.1 mm. diameter was studied. It shows fiber structure, the graphite planes being parallel to the whisker axis. All evidence suggests that the whisker grew from its base by diffusion of C along the high energy boundary between the whisker and the matrix.

15687* (German.) Structure of Vitreous B_2O_3. **Struktur des glasigen B_2O_3.** F. Herre and H. Richter. *Zeitschrift für Naturforschung*, v. 12a, July 1957, p. 545-550.

Boron oxide was studied in vitreous (20 C) and melted (450 and 600 C) phases with CuK_α and MoK_α radiation.

See also: **15703** (ceramic gas filters); **15823** (reactivity of uranium oxides); **15838** (uranium oxide data); **16363** (wire-wound resistance furnaces); **16384** (ferroelectric ceramics); **16403** (silicone lubricants in bottlemaking); **16671** (ceramic cutting tools); **16740** (sintering procedures); **16827** (glass fibers for reactor fuels); **16870** (diffusion of uranium through graphite).

CHEMICAL ENGINEERING

15688 Possible Pharmaceutical Applications for Aerosols. Martin Barr. *Aerosol Age*, v. 2, Sept. 1957, p. 19 + 3 pages.

Therapeutic applications in dermatologicals; ear, nose, and throat drugs; dental preparations; and other materials.

15689* Developments in Saline Water Conversion. David S. Jenkins. *American Water Works Association, Journal*, v. 49, Aug. 1957, p. 1007-1019.

15690* Mixed Bed Ion Exchange for the Removal of Radioactivity. H. Gladys Swope. *American Water Works Association, Journal*, v. 49, Aug. 1957, p. 1085-1102.

The capacity of a mixed bed exchanger is based on the amount of total dissolved solids in the feed—the lower the dissolved solids content, the larger the throughput.

15691* Liquid Atomisation in Chemical Engineering. R. P. Fraser, P. Eisenklam, and N. Dombrowski. *British Chemical Engineering*, v. 2, Aug. 1957, p. 414-417.

Classification and common industrial use of atomizers; mechanism of disintegration, spray sheet development, expansion of liquid surfaces; drop size from atomizers; effect of ambient conditions.

15692* Application of Automatic Process Control to Chemical Engineering. III. Response to a Fluctuating Disturbance. N. J. Hassett. *British Chemical Engineering*, v. 2, Aug. 1957, p. 420-423.

Response of a thermometer to a sudden temperature rise and to fluctuation of that new temperature.

15693 Wetted-Wall Packing—A New Distillation Column Packing. A. R. Bancroft and H. K. Rae. *Canadian Journal of Chemical Engineering*, v. 35, Aug. 1957, p. 77-85.

The performance of a wetted-wall type of packing consisting of closely spaced parallel vertical sheets of Al was investigated. The liquid flows down the surfaces of the sheets as a thin film in contact with the rising vapor. Tests were conducted in a 6 in. x 6 in. square column 50 ft. high at total reflux with the systems H_2O-HDO and ethanol-isopropanol. Four sheet spacings ranging from 3/16 to 1/2 in. were used.

15694 Chemical Engineering in the Coal Industry. Forbes W. Sharpley, editor. 141 p. 1956. Pergamon Press, New York. (TP325 G79c)

A compilation of seven papers presented at an international conference, June 1956.

15695 Distribution of Porosity in Filter Cakes. F. B. Hutto, Jr. *Chemical Engineering Progress*, v. 53, July 1957, p. 328-332.

Porosity decreases relatively rapidly near the liquid face of the cake and then continues at a slower, almost linear rate of decrease down to minimum porosity at the septum.

15696 Properties of Materials at Low Temperatures. R. J. Corruccini. *Chemical Engineering Progress*, v. 53, July 1957, p. 342-346.

(To be continued.)

15697* Principles of Refining Lubrication Oil. II. A. Doll-Steinberg. *Chemical & Process Engineering*, v. 38, Aug. 1957, p. 327-331.

The solvent extraction method of refining; comparison of various solvents; problems of dewaxing.

15698* (German.) Apparatus for Continuous Measurement of the Nitrifying Capacity of Nitrifying Acids. **Gerät zur kontinuierlichen Messung des Nitriervermögens von Nitriersäuren.** H. Krupp and W. Letschert. *Chemie-Ingenieur-Technik*, v. 29, Aug. 1957, p. 517-519.

A new apparatus is described which measures the thermal gradients occurring in the reaction between nitrifying acid and benzol, and thus continuously determines the nitrifying capacity of the acids.

15699* (German.) Safety in Explosives Factories. **Sicherheit in Sprengstoffbetrieben.** Hans Pessiack. *Chemiker-Zeitung*, v. 81, Aug. 5, 1957, p. 490-493.

Explosive disintegration through overloading, protective measures, neatness and cleanliness, equipment, operating conditions. (To be continued.)

15700* (Italian.) Considerations on the Mechanical Stress Originated by Heat Flow in Chemical Plants. **Considerazioni sulle sollecitazioni meccaniche prodotte da flusso termico nelle apparecchiature per l'industria chimica soggette a forte transmissione di calore.** Ambrogio Galbiati. *Chimica e l'Industria*, v. 39, July 1957, p. 541-547.

Through the walls of chemical and petroleum plants thermal gradients can exist which induce intense mechanical stress. The phenomenon is analyzed through its main parameters and through the discussion of two of the most generally employed materials Aq35 carbon steel and 18/8 austenitic stainless steel. In the latter, thermally generated stresses are 4.5 times greater at normal temperature and 1.6 times greater at 500 C.

15701 Optimizing Control of a Chemical Process. D. P. Eckman and I. Lefkowitz. *Control Engineering*, v. 4, Sept. 1957, p. 197-204.

Results of research in optimizing control prove the feasibility of computing-control: a savings in time of 23% in processing batch reaction. The processing follows an optimum path described by the proper differential equations dependent on the nature of the process kinetics and on initial and final composition values. The optimum path yields a minimum processing time for the specified conditions of operation.

15702* Side-Entering Propeller Agitators. Robert L. Bates. *Cost Engineering*, v. 2, July 1957, p. 77-83.

Improvements in mechanical design and increased effectiveness have accounted for the use of this type agitator in about 25% of the installations.

15703* (German.) Tests With Ceramic Gas Filters. **Versuche mit kerammischen Gasfiltern.** Fritz Herning and Herbert Bellenberg. *Gas- und Wasserfach*, v. 98, Ausgabe Gas, Aug. 2, 1957, p. 781-784.

A process for cleaning ceramic filters without disassembling them, consisting in a sudden release of the gas volume in the filters by means of an outlet valve. The filter should have a conical and not a flanged body.

15704* (Japanese.) **Studies on Separation of Raw Materials From Sea Water. V. Reaction Between Na_2CO and Sea Water Free From Mg^{++} by Pretreatment.** Seiichi Ishizaka and Yoshiro Wada. **VI. Properties of Concentrated Sea Water Free From Mg^{++} and Ca^{++}.** Shigeo Iwata. **VII. Removal of Ca^{++} From Sea Water.** Seiichi Ishizaka and Matsuo Terada. **VIII. Phase-Diagramatic Studies on Separation of Na_2SO_4, NaCl and KCl.** Seiichi Ishizaka and Shigeo Iwata. **IX. Characteristics of Magnesium Hydroxide on Filtration.** Koichi Tawara and Kazuo Satō. *Government Chemical Industrial Research Institute, Tokyo, Reports*, v. 52, June 1957, p. 187-218.

15705 The Effect of Maldistribution on the Performance of Packed Columns. J. W. Mullin. *Industrial Chemist*, v. 33, Aug. 1957, p. 408-417.

Distribution of liquid flow in distillation columns and its bearing on the performance of these columns.

15706 Sulfuric Acid From Anhydrite. William Q. Hull, Frank Schon, and Hans Zirngibl. *Industrial and Engineering Chemistry*, v. 49, Aug. 1957, p. 1204-1214.

Coke is used as a reducing agent and Al-containing materials are added so that Portland cement is produced ton-for-ton of acid. The chemical reactions of sulfate decomposition and differences in cement-clinker production are discussed.

15707 Oxygen Absorption in Agitated Tanks. A. M. Friedman and E. N. Lightfoot, Jr. *Industrial and Engineering Chemistry*, v. 49, Aug. 1957, p. 1227-1230.

Rate of O absorption is independent of air flow at a given impeller speed over a wide range of operating conditions. Flat-bladed impellers are superior to vaned disks only at low air rates.

15708 Mixed Esters of Amylose. Ivan A. Wolff, David W. Olds, and G. E. Hilbert. *Industrial and Engineering Chemistry*, v. 49, Aug. 1957, p. 1247-1248.

Mixed aliphatic esters of amylose can be converted to good quality films and molded products; availability depends upon continued progress in development of special corn hybrids having high-amylose starch.

15709 Acidic Components of Catalytically Cracked Distillate Fuel Oil. Albert L. Williams and Robert D. Offenhauer. *Industrial and Engineering Chemistry*, v. 49, Aug. 1957, p. 1259-1264.

Aromatic thiols separated from catalytically cracked distillate fuel oil promote sediment formation, but of the phenols present only 1-naphthol is active in development of color and sediment.

15710 Sediment Formation in Catalytically Cracked Distillate Fuel Oils. R. D. Offenhauer, J. A. Brennan, and R. C. Miller. *Industrial and Engineering Chemistry*, v. 49, Aug. 1957, p. 1265-1266.

Removal of either aromatic thiols and 1-naphthol or pyrroles from the fuel oils studied practically eliminates sediment formation.

15711 Equilibrium in Ternary Ion Exchange Systems. Joshua Dranoff and Leon Lapidus. *Industrial and Engineering Chemistry*, v. 49, Aug. 1957, p. 1297-1302.

Engineering design equations permit accurate prediction of the performance of an ion exchange column with a ternary system, when equilibria between ion pairs are known.

15712 Vapor-Liquid Equilibria. Dilute Nitric Acid, Hydrochloric Acid, and Hydrochloric Acid-Nitric Acid-Water Solutions. R. C. Reid, et al. *Industrial and Engineering Chemistry*, v. 49, Aug. 1957, p. 1307-1310.

Design data for HCl and/or HNO_3 gas absorbers.

15713 Equations of State. C. J. Pings, Jr. and B. H. Sage. *Industrial and Engineering Chemistry*, v. 49, Aug. 1957, p. 1315-1328.

Volumetric behavior in liquid and gas phases and enthalpy changes can be predicted by use of a new equation of state. Practical application of this equation to propane is shown.

15714* Liquid-Liquid Extraction. IX. A Further Study of Individual Film Coefficients for a Packed Column. X. Overall Mass Transfer Coefficients of an Area Basis for the Extraction of Acetone in Packed Columns. R. Gayler and H. R. C. Pratt. **XI. Mass Transfer Data for the Extraction of Uranyl Nitrate in a Packed Column.** L. E. Smith, J. D. Thornton, and H. R. C. Pratt. *Institution of Chemical Engineers, Transactions*, v. 35, no. 4, 1957, p. 267-300.

15715* A Servo-Controlled Continuous Feeder. J. C. R. Heydenrych and U. A. Luoto. *Institution of Mechanical Engineers, Proceedings*, v. 170, no. 27, 1956, p. 931-940.

Circuit details of an electronically controlled automatic feeder. Servo techniques are used to keep a weighing machine in continuous balance.

15716* The Use of Cetyl Alcohol to Reduce Reservoir Evaporation. F. Grundy. *Institution of Water Engineers, Journal*, v. 11, Aug. 1957, p. 429-437 + 2 plates.

Results of experiments carried on in arid regions of Australia and Africa.

15717* (Russian.) Isopropylbenzene Hydrogen Peroxide and Its Technical Application. **Gidroperekis' izopropilbenzola i ee tekhnicheskoe primenenie.** P. G. Sergeev and B. D. Kruzhalov. *Khimicheskaia Promyshlennost'*, 1957, no. 4, June, p. 9-18.

Production of isopropylbenzene hydrogen peroxide and its properties. Method of obtaining α-methyl styrene by reaction with alkali and obtaining phenol and acetone by reacting with acids.

15718* (Russian.) Industrial Unit for Producing Emulsions With the Aid of a Supersonic Liquid Jet. **Promyshlennaia ustanovka dlia polucheniia emul'sii pri pomoshchi ul'trazvukovogo zhidkostnogo svistka.** S. N. Sun'kova and S. A. Puzyrev. *Kolloidnyi Zhurnal*, v. 19, May-June 1957, p. 387-389.

Unit provides the means for obtaining diverse emulsions, including those of silicanes, without using emulsifiers. The emulsions are highly disperse and stable.

15719* Glycerin in the Manufacture of Adhesives. F. N. Reckless. *Manufacturing Chemist*, v. 28, Aug. 1957, p. 376-377.

A representative selection of formulas is given.

15720 Evaluation of Sieve Plates for Steam Stripping of TBP From Evaporator Feed Streams. C. V. Chester. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2339, July 1957, 12 p. (UF767 U3O Contin.)

Tests of a 6-in. diameter plate in the uranyl nitrate-water-tributyl phosphate system.

15721* Pressure Filling of Viscous Products. Robert E. Sueter and John D. Henze. *Package Engineering*, v. 2, Sept. 1957, p. 25 + 4 pages.

A way to fill viscous products at relatively high speeds without getting air bubbles in the filled containers. Practical operating procedures; details of equipment; use; functional hazards arising during operation.

15722* Hydrogen Treating in the Refinery. I. P. W. Sherwood. *Petroleum*, v. 20, Aug. 1957, p. 281-284.

The factors influencing the results of various commercial processes are reviewed.

15723 Molecular Sieves Boost Octane Ratings of Light Naphtha and Reformate. William C. Ziegenhain. *Petroleum Engineer (Management Ed.)*, v. 29, Aug. 1957, p. C6-C12.

Results of bench-scale studies on the adsorption and desorption characteristics of molecular sieves. Studies included the binary system of toluene and n-heptane, light virgin naphtha, catalytic reformate, and catalytic cracked naphtha.

15724 Hydrogen Peroxide—Petrochemical Newcomer. I. Applications of H_2O_2; Established Manufacturing Processes. Peter W. Sherwood. *Petroleum Engineer (Management Ed.)*, v. 29, Aug. 1957, p. C22 + 4 pages.

Technical aspects of the three routes to hydrogen peroxide involving the organic intermediates: alkyl anthraquinone, lower hydrocarbons, and isopropanol.

15725 Fluid Catalyst Design Data. V. Calculate Fluidization Rates. Frederick A. Zenz. *Petroleum Refiner*, v. 36, Aug. 1957, p. 147-155.

Review of the effects of variables leading to particulate and aggregative fluidization; chart for computing fluidization rates and the velocity-bed density relationship for the particulate mode.

15726 (French.) Alkylation in Industrial Production of Higher Hydrocarbon Structures. **L'alcoylation dans la production industrielle de structures hydrocarbonées.** R. Jenny. *Revue de l'Institut Francais du Pétrole et Annales des Combustibles Liquides*, v. 12, May 1957, p. 576-598.

Essential characteristics of the chief industrial alkylation processes.

15727 (Italian.) Catalytic Activation of Hydrogen in Solution. **Attivazione catalitica dell'idrogeno in soluzione.** A. Fiumara and G. Salvi. *Rivista dei Combustibili*, v. 11, May 1957, p. 308-318.

A new technique of hydrogenation in solution and the possibility of slight hydrogenation in normal atmosphere. Mechanism of homogeneous hydrogenation. Possibility of application to oil refining.

15728* Fundamentals of Applied Fluoridation. James L. Henry and James F. Haskett. *Water & Sewage Works*, v. 104, Aug. 1957, p. 348-354.

The factors involved in the selection of the particular compound that would present the most economical approach to applied fluoridation.

15729* New Type Reforming Catalyst Tested. *World Petroleum*, v. 28, July 1957, p. 70-74.

Universal Oil Product Co.'s new catalyst, R-8 for super-octane motor fuels is used.

15730* Electrofining. R. W. Stenzel. *World Petroleum*, v. 28, July 1957, p. 78-81.

A treatment developed to meet problems of modern catalytic conversion processes.

15731* Vinyl Acetate: Petroleum-Derived Growth Chemical. Peter W. Sherwood. *World Petroleum*, v. 28, Aug. 1957, p. 52 + 4 pages.

Nearly all production is obtained by the esterification of acetic acid by acetylene. An alternate method, which offers considerable potential, looks to acetic anhydride and acetaldehyde as raw materials.

See also: **15605** (superphosphate for immediate ammoniation); **15895** (impurities in petroleum); **15999** (solvent extraction of Cr); **16229** (fixed bed system); **16258** (anti-caking agents); **16301** (radiation applications in the petroleum industry); **16912** (prediction of gas heat capacity); **16944** (performance of reinforced polyester plastics); **16970** (economic evaluation of plastic piping); **17037** (nonwoven filter media).

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15732* (English.) **The Complex Between Hydroxamic Acids and Ferric Ions, and the Use of the Complex for Quantitative Determination of Hydroxamic Acids, Acyl Derivatives and Ferric Salts.** Gunnar Aksnes. *Acta Chemica Scandinavica*, v. 11, no. 4, 1957, p. 710-716.

15733* (German.) Spectrochemical Determination of Magnesium, Zinc, Vanadium, and Chromium in Pure Aluminium, Using the Spray Method With a Hollow Electrode. **Spektralanalytische Bestimmung des Magnesium-, Zink-, Vanadin- und Chromgehaltes von Reinaluminium unter Anwendung einer durchbohrten Elektrode.** László Erdey, Ernő Gegus, and Elemér Kocsis. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 11, nos. 3-4, 1957, p. 277-294.

15734 Inorganic Complex Compounds Containing Polydentate Groups. XVI. A Study of the Complex Ions Formed by the Copper(II) Ion With Triethylenetetramine, Tetraethylenepentamine and Pentaethylenehexamine. Hans B. Jonassen, J. Aaron Bertrand, Frank R. Groves, Jr., and Robert I. Stearns. *American Chemical Society, Journal*, v. 79, Aug. 20, 1957, p. 4279-4282.

The copper(II) ion exhibits an amine coordination number of five with these compounds; hydrogen complexes are formed.

15735 Spectrophotometric and Solvent-Extraction Studies of Uranyl Phosphate Complexes. Burton J. Thamer. *American Chemical Society, Journal*, v. 79, Aug. 20, 1957, p. 4298-4305.

A study of uranyl phosphate complexes was made at an ionic strength of 1.06 to 1.07 and a temperature of 24 to 25 C. Spectrophotometric study yielded a formation constant of 15.5 for the complex $UO_2H_2PO_4+$. Solvent-extraction data showed that the further complexes $UO_2(H_2PO_4)_2$ and $UO_2(H_2PO_4)_2 \cdot H_3PO_4$ have the formation constants 21.8 and 10.2, respectively.

No statistically significant evidence was obtained for the existence of a still higher complex.

15736 Paper Chromatography of Lipides. H. Schlenk, Joanne L. Gellerman, Jerry A. Tillotson, and H. K. Mangold. *American Oil Chemists' Society, Journal,* v. 34, Aug. 1957, p. 377-386.

Procedures for qualitative and quantitative paper chromatography of lipides are described. Chain-length analysis by paper chromatography and low-temperature chromatography have been introduced and are promising methods to approach a completely micro method for analyzing complex mixtures.

15737 Separation of the Oxidation Products of Fatty Acids by Means of Gas-Liquid Partition Chromatography. Janina Nowakowska, E. H. Melvin, and Richard Wiebe. *American Oil Chemists' Society, Journal,* v. 34, Aug. 1957, p. 411-414.

The oxidation of oleic, and particularly of linoleic and linolenic acids, indicated the presence of a considerable number of unexpected products. The chromatograms of the oxidized pure C_{18} acids, of Neo-Fat no. 140, and of a mixture of fatty acids from hydrolyzed soybean oil showed a striking similarity in many respects. It was not possible to identify all the peaks in the chromatograms and to obtain a quantitative estimate of the oxidation products.

15738* The Determination of Atmospheric Mercury Trapped in Permanganate Solutions. A Modified Method. R. G. Drew and E. King. *Analyst,* v. 82, July 1957, p. 461-467.

The use of H_2O_2 as a reducing agent for acid $KMnO_4$ solutions before the determination of trapped Hg is described. The degree of accuracy of a modified extractive titration method under various interfering conditions is indicated.

15739* Comparison of Flame-Photometric and Chemical Methods for Determining Sodium and Potassium in Soil, Plant Material, Water and Serum. M. Puffeles and N. E. Nessim. *Analyst,* v. 82, July 1957, p. 467-474.

The correction of the results by the chemical methods for the recovery error and of the results by flame-photometric methods for interference by calcium and phosphate considerably reduces the otherwise large discrepancies.

15740* The Determination of Excess of Zinc in Zinc Oxide. H. J. Allsopp. *Analyst,* v. 82, July 1957, p. 474-483.

A description of a H evaluation technique.

15741* The Determination of Small Amounts of *o*-Phenylphenol. D. Harvey and G. E. Penketh. *Analyst,* v. 82, July 1957, p. 498-503.

Ultra-violet spectrophotometry, colorimetry, or fluorescence methods of determination.

15742* The Determination of 4-Aminodiphenyl in Technical Diphenylamine. H. E. Stagg and R. H. Reed. *Analyst,* v. 82, July 1957, p. 503-506.

Determination is by a combination of chromatography on filter-paper and absorptiometry. Typical samples of diphenylamine contained 0·007 to 0·025%.

15743 General Procedure for Setting Up Infrared Differential Analyses of Multicomponent Mixtures. John A. Perry and George H. Bain. *Analytical Chemistry,* v. 29, Aug. 1957, p. 1123-1127.

Process is illustrated by analysis of a six-component C_4 hydrocarbon gas.

15744 Infrared Spectrophotometric Analysis of Fractional Milligram Quantities of Solids. J. J. Kirkland. *Analytical Chemistry,* v. 29, Aug. 1957, p. 1127-1129.

Design and operation of an evacuable die for pressing small rectangular KBr pellets used in the infrared analysis of solids. Die serves as pellet holder and enables 0.25 to 0.4μ mole quantities to be scanned without auxiliary beam-condensing optical equipment.

15745 Separation of Uranium From Thorium, Bismuth, and Ores With Tributyl Phosphate. Spectrophotometric Determination With 8-Quinolinol. A. R. Eberle and M. W. Lerner. *Analytical Chemistry,* v. 29, Aug. 1957, p. 1134-1139.

15746 Direct-Reading Spectrochemical Analysis of Nonmetallics Used in the Aluminum Industry. R. H. Black and P. E. Lemieux. *Analytical Chemistry,* v. 29, Aug. 1957, p. 1141-1144.

Direct-current arc excitation is employed. Objective is to reduce analytical costs.

15747 Gravimetric Determination of Boron. Precipitation as Nitron Tetrafluoborate. Claude A. Lucchesi and Donald D. DeFord. *Analytical Chemistry,* v. 29, Aug. 1957, p. 1169-1171.

A simple gravimetric method for the determination of boric acid in aqueous solution.

15748 Determination of Molybdenum in Titanium Alloys by Precipitation From Homogeneous Solution Using Thioacetamide. William N. McNerney and William F. Wagner. *Analytical Chemistry,* v. 29, Aug. 1957, p. 1177-1178.

15749 Analytical Distillation Laboratory Design for Efficiency and Versatility. C. B. Kincannon and Maurice O. Baker. *Analytical Chemistry,* v. 29, Aug. 1957, p. 1189-1193.

Stalls are designed to accomodate any one of a variety of types of columns and are provided with utilities for operation at atmospheric or subatmospheric pressure.

15750 Effect of Temperature on the Precision and Performance of a Microchemical Balance. D. E. Hull. *Analytical Chemistry,* v. 29, Aug. 1957, p. 1202-1204.

A rhythmic procedure for weighing at ordinary room temperatures is proposed.

15751 Colorimetric Assay for Reaction of Sulfhydryl Groups With Organic Mercurials. Irwin Fridovich and Philip Handler. *Analytical Chemistry,* v. 29, Aug. 1957, p. 1219-1220.

Provides a method for the quantitative determination of millimicromolar amounts of sulfhydryl compounds.

15752 Determination of Calcium or Zinc Additives in Lubricating Oils and Concentrates by an (Ethylenedinitrilo) Tetraacetic Acid Titration Method. P. B. Gerhardt and E. R. Hartmann. *Analytical Chemistry,* v. 29, Aug. 1957, p. 1223.

15753 Zone Electrophoresis on Sponge Rubber. Herschel K. Mitchell and Leonard A. Herzenberg. *Analytical Chemistry,* v. 29, Aug. 1957, p. 1229.

Suitable for separation of small amounts of proteins.

15754 Colorimetric Analysis With Organic Reagents. John H. Yoe. *Analytical Chemistry,* v. 29, Sept. 1957, p. 1246-1251.

The vast number and great variety of organic compounds offer a promising field for new and better reagents for colorimetric analysis, both inorganic and organic, and amply justify further research.

15755 Differential Thermal Analysis. New Technique for Testing Silica-Alumina Catalysts. Robert L. Stone and Howard F. Rase. *Analytical Chemistry,* v. 29, Sept. 1957, p. 1273-1277.

Uses the analyzer for determinations of carbon content of catalysts, studies on catalyst poisoning, measurement of heats of chemisorption, and studies of chemical and physical properties of catalysts.

15756 Internally Standardized General Spectrographic Method. A. J. Frisque. *Analytical Chemistry,* v. 29, Sept. 1957, p. 1277-1279.

A rapid general spectrographic method that is capable of determining a large number of elements in a wide variety of matrices within 25%.

15757 Determination of Total Sulfur in Petroleum Products. Combustion and Disodium Ethylenediamine Tetraacetate Titrimetric Method. O. N. Hinsvark and Francis J. O'Hara. *Analytical Chemistry,* v. 29, Sept. 1957, p. 1318-1322.

Samples covering concentrations from 100 to several thousand p.p.m. of S have been successfully analyzed without interference from halides or nitrogen. A statistical analysis of naphtha and diesel fuel control samples shows excellent repeatability, with a maximum standard deviation of ± 8 p.p.m. in concentration ranges of 100 to 200 p.p.m. of S.

15758* (German.) Further Development of Photoelectric Colorimetric Processes. Determining Phosphorus, Tungsten, Silicon, Nickel, and Boron in Steels. **Weiterentwicklung lichtelektrischer kolorimetrischer Verfahren. Die Bestimmung von Phosphor, Wolfram, Silizium, Nickel und Bor in Stählen.** Erich Piper and Heinz Hagedorn. *Archiv für das Eisenhüttenwesen,* v. 28, July 1957, p. 373-377.

15759* (German.) The Influence of Particle Size of Segregated Silicates in Steel on the Result of Photometric Silicon Analysis. **Einfluss der Teilchengrösse ausgeschiedener Kie-**

selgläser im Stahl auf das Ergebnis der photometrischen Siliziumbestimmung. Wilhelm Anton Fischer and Manfred Wahlster. *Archiv für das Eisenhüttenwesen*, v. 28, July 1957, p. 379-382.

Effect of primary (10-15μ) and secondary 2-4μ) silicate inclusions in soft iron smelts deoxidized with Si. Photometric process is accurate only when silicate particles are smaller than 6μ.

15760 Accurate Weighing With the Microchemical Balance. D. S. Flikkema. *Argonne National Laboratory (U. S. Atomic Energy Commission)*, ANL-5767, Aug. 1957, 19 p. (UF767 Un3.1an Contin.)

The procedural description of a technique for sixth place weighing with sections on balance installation and maintenance, a discussion of the factors influencing apparent weights, and a program for balance testing.

15761* Separation and Identification of Four Anti-Oxidants, Butylated Hydroxyanisole, Butylated Hydroxytoluene, N-Propyl Gallate, and Nordihydroguaiaretic Acid, by Paper Chromatography. Lloyd C. Mitchell. *Association of Official Agricultural Chemists, Journal*, v. 40, Aug. 1957, p. 909-915.

15762* An Improved Method for the Microdetermination of Arginine by Use of 8-Hydroxyquinoline. G. Ceriotti and L. Spandrio. *Biochemical Journal*, v. 66, Aug. 1957, p. 603-607.

Quantitative determination of arginine between 0.5 and 6μ g./ml.; the color is stable for at least 12 hr. Results are constant and reproducible (standard deviation ± 1·3%).

15763 Spectrographic Determination of Phosphorus in Steel. H. Krempl and H. Bertram. *Henry Brutcher Translation No.* 3761, 19 p. (From *Archiv Eisenhüttenwesen*, v. 27, no. 5, 1956, p. 303-309.) Henry Brutcher, Altadena, Calif.

Density of phosphorus lines in four regions of the spectrum as a function of phosphorus concentration are considered. Variables are discussed.

15764 Determination of Finely Divided Vanadium, Molybdenum, and Titanium Carbides. N. M. Popova, A. F. Platonova, L. V. Zaslavskaya, and M. F. Rybina. *Henry Brutcher Translation No.* 3959, 7 p. (From *Zavodskaya Laboratoriia*, v. 23, no. 3, 1957, p. 269-272.) Henry Brutcher, Altadena, Calif.

Correlation between maximum content of finely divided carbides and the maximum secondary hardness on tempering these steels.

15765 Accelerated Method of Determining Small Amounts of Aluminum in Steel and Cast Iron. N. A. Agrinskaya. *Henry Brutcher Translation No.* 3960, 4 p. (From *Zavodskaya Laboratoriia*, v. 23, no. 3, 1957, p. 279-280.) Henry Brutcher, Altadena, Calif.

Colorimetric determination of Al in steel and cast iron with stilbazo, without prior separation of Fe which may be present in 10,000-fold excess.

15766 Fractional Determination of Hydrogen in Steel. B. A. Shmelev. *Henry Brutcher Translation No.* 3963, 13 p. (From *Zavodskaia Laboratoriia*, v. 23, no. 3, 1957, p. 263-269.) Henry Brutcher, Altadena, Calif.

Liberation of H in various fractions by progressive increase in temperature of vacuum heating shows four distinct steps.

15767* Infra-Red Absorption Analysis as a Process Tool. R. Quarendon. *Chemical & Process Engineering*, v. 38, Aug. 1957, p. 317-323.

Description of various types of infra-red analytical equipment; applications; possibilities of use for the automatic control of process operations.

15768* (English.) **Separation of α-Glycerophosphate From Its β-Isomer by Column Chromatography.** Chieko Urakami, Hiroko Murahashi, and Yoshiko Kakutani. *Chemical Society of Japan, Bulletin*, v. 30, June 1957, p. 379-381.

15769 The Electrolytic Determination of Gallium. H. Terrey and J. Thabit. *Chemical Society, Journal*, 1957, July, p. 3064-3066.

Gallium is determined in an alkaline sulfate solution. The Pt gauze electrodes are protected by prior deposition of Cu.

15770* (German.) Gas Phase Thermal Chromatography. A New Analytical Method for Separating and Determining Complex Mixtures. **Thermochromatographie in der Gasphase. Eine neue Analysenmethodik zur Trennung und Bestimmung von Vielstoffgemischen.** Helmut Kögler. *Chemische Technik*, v. 9, July 1957, p. 400-403.

Isothermal gas chromatography. Thermal chromatographic technique. Calculation of the results. Applications.

15771* (German.) Determining Boron Traces in Light Alloys Having a High Silicon Content. **Bestimmung von Bor-Spuren in Leichtmetallegierungen mit hohem Siliciumgehalt.** Christian Scharrnbeck. *Chemische Technik*, v. 9, July 1957, p. 416-418.

From 0.001 to 0.1% of boron was detected in Al alloys with a high Si content. The H_2SO_4 concentration of about 93% was prepared by adding oleum to the aqueous solution.

15772 EDTA Titration of Tin in Copper Base Alloys. Jorma Kinnunen and Bertil Wennerstrand. *Chemist-Analyst*, v. 46, June 1957, p. 34 + 2 pages.

15773 The EDTA Titration: Nature & Methods of End Point Detection. III. A. J. Barnard, Jr., W. C. Broad, and H. Flaschka. *Chemist-Analyst*, v. 46, June 1957, p. 46-56.

A review of the visual use of additional indicators as well as, in part, the detection of the end point by redox effects.

15774* (German.) Paper Chromatography and Paper Electrophoresis. **Papierchromatographie und Papierelektrophorese.** A. Grüne. *Chimia (Switzerland)*, v. 11, July 1957, p. 173-203.

Historical survey. Theory and practice. Chromatogram conveyor. Reproducibility of the R_f values. Two dimensional and multidimensional works. Stains on the paper. Paper electrophoresis. Applications.

15775* (French.) Simple Infra-Red and Ultra-Violet Photometers in Analytical Chemistry. **Les photomètres simples infrarouges et ultra-violets en Chimie Analytique.** A. Berton. *Chimie Analytique*, v. 39, Aug. 1957, p. 288-297.

Description of simple photometers and application in IR, to such determinations as gases and vapors, and light water in heavy water, and in UV to the determination of vitamins and hormones, of linoleic acid and ethylene derivatives in mixtures.

15776* (French.) Physical Identification of the Manganese Carbides. **Sur la caractérisation physique des carbures de manganèse.** Marius Picon and Jean Flahaut. *Comptes Rendus*, v. 245, July 29, 1957, p. 534-537.

Quadratic CMn_4. Orthorhombic and hexagonal C_2Mn_6, triclinic and hexagonal C_3Mn_3 and a cubic carbide, probably C_3Mn_5 were identified by the X-ray spectra and densities. Global formula was $C_2Mn_{(2n+2)}$. Compositions were checked.

15777* (German.) A Contribution to the Analysis of Hydrocarbon Mixtures. **Beitrag zur Analytik von Kohlenwasserstoffgemischen. II.** Developing a Rapid Analytical Method. **Entwicklung einer Schnellanalysenmethode.** Gerhard Kuhnhanss, Hedwig Rösner, Erhard Hüttig, Manfred Wagner, and Gottfried Tischendorf. *Erdöl und Kohle*, v. 10, July 1957, p. 435-441.

Characterizing complex mixtures, such as mineral oils and the fuels and lubricants obtained by hydration, by means of their density and index of refraction.

15778* (German.) The Quantitative Determination of Long-Chain, Quaternary Ammonium Compounds. **Die quantitative Bestimmung langkettiger quartärer Ammonium-Verbindungen.** R. Neu. *Fette, Seifen, Anstrichmittel*, v. 59, July 1957, p. 503-505.

The principle of the method is the quantitative precipitation of surface-active, cation-active halides with $NaClO_4$. Excess reagent is titrated back with $AgNO_3$ and $KBrO_3$. From the halogen content found, the mol. wt. of the ammonium compound is calculated.

15779 Works Laboratory Procedures. v. II. *Goodyear Atomic Corporation (U. S. Atomic Energy Commission)*, GAT 115 (Rev.), Jan. 1957, not paged. (RA421 G63g Contin.)

A compilation of various analytical procedures.

15780 Development of a Coincidence Spectrometer and a Method for Analysis of Cobalt-60. H. R. Helmholz. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-49718, Apr. 1957, 67 p. (UF767 Un3.1hw Contin.)

A specific instrumental method is described for the determination of Co^{60} in fission product waste streams. The possible application of this instrument to other special analytical procedures is discussed.

15781 An Extraction Method for the Determination of Radioruthenium in Organic Samples. D. W. Shannon. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-48736, May 1957, 16 p. (UF767 Un3.1hw Contin.)

15782* (Czech.) Quantitative Phase Analysis of Kovar Alloys by X-Ray Diffraction Methods. **Kvantitativní fázový rozbor slitin "kovar" röntgenovým zářením.** Alexander Spirkov. *Hutnické Listy*, v. 12, July 1957, p. 609-614.

15783* Some Features of Gas-Liquid Chromatography. G. Burrows. *Institution of Chemical Engineers, Transactions*, v. 35, no. 4, 1957, p. 245-257.

Equations incorporating the solubility coefficient, the pore size, and the liquid layer thickness in the column are derived and are shown to give results that are supported by experimental evidence. The effects of the quantity of material injected and of the operating temperature of the column are discussed.

15784* (Spanish.) Spectrochemical Determination of Silicon in Low Alloy and Simple Alloy Steels. **Determinacion espectroquimica del silicio en aceros de baja y alta aleacion.** Hilaria Carrancio de la Plaza. *Instituto del Hierro y del Acero*, v. 10, Apr.-June 1957, p. 195-199.

Quantitative determination of Si in steels by the Gerlach method. Applying a pair of lines previously studied to a higher concentration area. In simple alloy steel a third element has no effect on the spectrochemical determination of Si.

15785 Color Reaction of 2,6-Dibromo-*N*-Chloro-*p*-Quinoneimine With Thiophosphate Insecticides on Paper Chromatograms. J. J. Menn, W. R. Erwin, and H. T. Gordon. *Journal of Agricultural and Food Chemistry*, v. 5, Aug. 1957, p. 601-602.

A simple and rapid detection paper chromatographic method for sulfur-containing phosphate ester insecticides. This color reaction is useful for rapid identification of a wide variety of thiophosphate insecticides from plant or animal residues.

15786 Infrared Analysis of Commercial Butylated Hydroxyanisole. Kermit Whetsel, Max Krell, and F. E. Johnson. *Journal of Agricultural and Food Chemistry*, v. 5, Aug. 1957, p. 602-604.

An infrared method has been developed which allows the isomers to be determined with a standard deviation of approximately ± 1%. The method is rapid and requires very little recalibration.

15787 Insecticide Determination. Colorimetric Method for the Determination of Cyclethrin. J. P. Sweeney and H. L. Williams. *Journal of Agricultural and Food Chemistry*, v. 5, Sept. 1957, p. 670-672.

15788 The Effect of Surface Abrasion on the Hydrogen Content of Steel. F. Cooke and C. E. A. Chanahan. *Journal of Applied Chemistry*, v. 7, July 1957, p. 388-392.

Abrasion of mild and stainless steel on a 3 M Company 120-grade SiC paper has been shown to increase the H content by 0·0049 and 0·0034 ml. per sq. cm. of apparent abraded area respectively. The application of the results to the determination of H in steel is discussed.

15789 Identification of the Sulfone Plant Metabolite of the Thiono Isomer of Systox. T. R. Fukuto, J. P. Wolf, R. L. Metcalf, and R. B. March. *Journal of Economic Entomology*, v. 50, Aug. 1957, p. 399-401.

The secondary metabolite from the cotton plant was isolated by column chromatography.

15790 Differential Thermal Analysis of Inorganic Hydrates. Hans J. Borchardt and Farrington Daniels. *Journal of Physical Chemistry*, v. 61, July 1957, p. 917-921.

Differential thermographs are presented for $CuSO_4 \cdot 5H_2O$, $CoCl_2 \cdot 6H_2O$, $MnCl_2 \cdot 4H_2O$, $SrCl_2 \cdot 6H_2O$, and $BaBr_2 \cdot 2H_2O$. Two kinds of anomalous peaks were observed.

15791 A Rapid Procedure for the Chromatographic Separation and Spectrophotometric Estimation of Certain Pasture Lipoids. I. Carotene, Xanthophyll and Chlorophyll. N. A. Worker. *Journal of the Science of Food and Agriculture*, v. 8, July 1957, p. 442-444.

The pigments are extracted with acetone, transferred to light petroleum, chromatographed on alumina into three fractions and then estimated spectrophotometrically. The method is rapid and accurate and is suitable as a routine assay procedure.

15792* Separation of Nickel & Zinc From a Mixture of Their Salts. II. Reduction of Nickel Oxide. R. A. Sharma, P. P. Bhatnagar, and T. Banerjee. *Journal of Scientific & Industrial Research*, v. 16, sec. A, June 1957, p. 255-259.

Studied effect of temperature on the reaction using varied amounts and different types of reducing agents and nickel oxide with different previous history of formation.

15793 The Ultraviolet Absorption Spectra of Diphenyl, Mono-Isopropyl Diphenyl, and Irradiated Mono-Isopropyl Diphenyl. D. Dutina and J. T. Porter, II. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission)*, KAPL-1768, Mar. 1957, 18 p. (UF767 Un3.1ka Contin.)

15794* (Hungarian.) Reaction-Kinetic Data on the Auto-Oxidation of Iodine in Bivalent Mercury-Salt Solutions. **Reakció-kinetikai adatok i jód autooxidációjához higany (II) só-oldatokban.** János Bognár and Szilvia Sárosi. *Magyar Kémiai Folyóirat*, v. 63, Feb.-Mar. 1957, p. 46-52.

Data on the potentiometric titration of As and Sb by means of iodate measuring solution.

15795* (Hungarian.) Theory of Paper Chromatography in a Dilute Medium. **A hígításos papírkromatográfia elméletéhez. I.** Motion and Distribution of Liquids in Paper. **Folyadékok mozgása és eloszlása a papírban.** Ernö Zichy and Ottó Szentjóbi. *Magyar Kémiai Folyóirat*, v. 63, Apr.-May 1957, p. 104-109.

Measurements of the distribution of different liquids in chromatographic paper. Phenomena near the liquid surface and liquid front. Formulas determining the quantity of the stationary and the mobile liquid phases. Specific liquid capacity of the amorphous cellulose.

15796* (Italian.) "Enchancements" and "Attenuations" in Spectrochemical Analysis in Relation to the Characteristics of the Light Source and to the Excitation Potentials of the Spectral Lines. Analytical Deductions. **"Esaltazioni" ed "attenuazioni" nell'analisi spettrochimica. Studio di esse in relazione con l'energia della sorgente e con il potenziale di ecctazione delle righe degli elementi. Deduzioni analitiche.** Vittorio Gazzi. *Metallurgia Italiana*, v. 49, June 1957, p. 419-424.

15797* (Italian.) Flame Spectrophotometric Determination of Sodium in Aluminum Oxide and Hydrate and in Waste Products of the Bayer Cycle. **Determinazione del sodio per spettrofotometria alla fiamma nell'ossido e idrato di alluminio e nel fango rosso (Cielo Bayer).** Lucia Braicovich and Maria Fabrizia Landi. *Metallurgia Italiana*, v. 49, June 1957, p. 465-474.

15798 Contributions to the Chemical Analysis of Copper in Zircaloy, Silicon in Uranium-Silicon Alloys, and Niobium in Uranium-Niobium Alloys. E. B. Read, et al. *Nuclear Metals, Inc. (U. S. Atomic Energy Commission)*, NMI-1178, May 1957, 17 p. (UF767 Un3.1nm Contin.)

15799 Solid Sample Mass Spectrometer Analyses of Enriched Stable Isotopes. Joe R. Walton. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2315, July 1957, 10 p. (UF767 U3o Contin.)

Solid sample mass spectrometer analyses were made on the enriched stable isotopes of 53 elements. The elements analyzed, compounds used, oven materials employed, ions monitored, and some special techniques of analyses are reviewed.

15800 Supplement No. 2 to Manual of the Analytical Methods Used by the Control Laboratory at the Chemical Processing Plant. Pt. I-II. M. J. Shepherd, Jr. and J. E. Rein. *Phillips Petroleum Company, Idaho Operations Office (U. S. Atomic Energy Commission)*, IDO-14316, Mar. 1957, 35 p. (UF767 Un3.1id Contin.)

15801 Determination of Uranium in Irradiated Thorium. Bernice E. Paige, Paul Goris, and James E. Rein. *Phillips Petroleum Co., Idaho Operations Office (U. S. Atomic Energy Commission)*, IDO-14411, June 1957, 11 p. (UF767 Un3.1id Contin.)

15802 Electrolytic Analysis of Copper Metal From Cyanide Solution. Walter O. Dow, Jr. and Gerald Bakker. *Plating*, v. 44, Sept. 1957, p. 969-970.

15803 Spectrophotometric Determination of Nickel in Bright Cadmium and Bright Gold Plating Solutions. Norman F. Doherty. *Plating*, v. 44, Sept. 1957, p. 971-974.

15804 The Principles and Applications of Polarography and Other Electroanalytical Processes. G. W. C. Milner. 729 p. 1957. Longmans, Green and Co., New York. (QD115 M63p)

Procedures in metallurgical, inorganic, and organic analysis with consideration of various techniques.

15805* (English.) **The Infra-Red Absorption Spectra of Some Salts of Dimethyl, Diethyl, and Diisopropyl Phosphate.** J. W. Maarsen and M. C. Smit. *Recueil des Travaux Chimiques des Pays-Bas*, v. 76, Aug. 1957, p. 724-728.

From the spectra of the cyclohexylammonium salts, which give relatively simple spectra in CCl_4 and CS_2 solutions, an unambiguous interpretation of the PO_2(ionic) stretching frequencies can be given.

15806* (Spanish.) Spectrochemical Analysis of Antifriction Alloys. **Valoración espectroquímica de aleaciones de antifricción.** A. Sampedro-Piñeiro and E. Asensi Álvarez-Arenas. *Revista de Ciencia Aplicada*, v. 11, May-June 1957, p. 193-203.

Optical emission spectra were applied to the evaluation of Sn-Sb, Sn-Sb-Cu, and Pb-Sn-Sb alloys. Errors found correspond to errors accepted as normal in industry.

15807* Principles and Problems in Development of a Dissolved Oxygen Analyzer. H. S. Levine and R. S. Kleinschmidt. *Sewage and Industrial Wastes*, v. 29, Aug. 1957, p. 856-863.

Describes a gasometric method for obtaining a continuous record of the dissolved O content of water; the design, operation, and performance of an instrument based on this method.

15808 Isolation and Determination by Ion Exchange Technique of Nonionic Surfactants. Lloyd E. Weeks, Martin E. Ginn, and Charles E. Baker. *Soap and Chemical Specialties*, v. 33, Aug. 1957, p. 47-50.

Nonionic portion of a surfactant mixture determined gravimetrically following sorption of ionic surfactants from aqueous ethanol solution on anion or cation exchange resins. Method is accurate and reproducible.

15809* (Russian.) Polarographic Determination of Lead and Thallium in Indium. **Poliarograficheskoe opredelenie svintsa i talliia v indii.** V. A. Tsimmergakl and T. D. Kazakovtseva. *Ukrainskii Khimicheskii Zhurnal*, v. 23, no. 3, 1957, p. 367-375.

On the basis of ammonium citrate a direct polarographic determination of 0.01% Pb in indium was possible. For a lesser percentage another method was suggested, giving 0.001% Pb determination for 5 g. indium. In 10 g. of indium 0.001% Tl was detected.

15810* (Russian.) Determination of Titanium in Steels by Extracting Its Complex With 1,8-α-Dioxynaphthalene. **Opredelenie titana v staliakh ekstragirovaniem ego kompleksa s 1,8-dioksinaftalinom.** A. K. Babko and O. I. Popova. *Ukrainskii Khimicheskii Zhurnal*, v. 23, no. 3, 1957, p. 376-380.

Light absorption spectra and physico-chemical properties of the Ti-diol complex. Determining Ti in steels by extracting with or without Cr precipitation; determination in ferrosilicon.

15811 A Systematic Study of Solvent Extraction With Acetylacetone. Anoop Krishen. *University of Pittsburgh (U. S. Atomic Energy Commission)*, NYO-6498, 1957, 133 p. (UF767 U3ny Contin.)

Schemes for separation of U from Bi, Cu from Al, and Hf from Zr were devised and tested. The need for precise constants for various compounds was brought out and it was noted that when such values were available, better agreement of calculated and experimental values of extraction could be expected.

15812 Use of Acetylacetone Extractions in Ferrous Analysis. James Patrick McKaveney. *University of Pittsburgh (U. S. Atomic Energy Commission)*, NYO-6507, 1957, 214 p. (UF767 U3ny Contin.)

The extraction characteristics of the hydrated ions of Cr(III), Fe(II), Fe(III), Mn(II), Mo(IV), Ti(IV), V(III), V(V), V(V), and W(VI) have been investigated using a 1:1 acetylacetone-chloroform solvent mixture. The extraction data for Cr(III), Mo(VI) and V(III) have been used in developing procedures for the analysis of these elements in ferrous materials.

15813* (French.) Application of Vacuum to the Analysis of Gases in Metals. **Les applications du vide à l'analyse des gaz dans les métaux.** M. Hanin. *Vide*, v. 12, Mar.-Apr. 1957, p. 148-161.

Nature of gas proportions in steels. Descriptions of a fusion apparatus for reduction under vacuum and of an automatic Toepler pump. Possible applications to other metals.

15814* (German.) The Theory of Visual End Point Determination in Complexometric Titrations. **Zur Theorie der visuellen Endpunktsbestimmung bei komplexometrischen Titrationen.** H. Flaschka and S. Khalafallah. *Zeitschrift für Analytische Chemie*, v. 156, no. 6, 1957, p. 401-411.

Development of formulas which permit the calculation of the limiting conditions for complexometric titrations and which indicate systematic errors.

15815* (German.) Contributions to the Analytical Chemistry of the Platinum Metals. **Beiträge zur analytischen Chemie der Platinmetalle. V.** The Separation of Very Small Amounts of Osmium and Ruthenium by Distillation. **Die Abtrennung geringster Mengen von Osmium und Ruthenium durch Destillation. VI.** The Separation of Osmium and Ruthenium by Extraction With Diphenylthiourea and Tetraphenylarsonium Compounds. **Die Trennung von Osmium und Ruthenium durch Extraktion der Diphenylthioharnstoff-und der Tetraphenylarsoniumverbindungen.** W. Geilmann and R. Neeb. *Zeitschrift für Analytische Chemie*, v. 156, no. 6, 1957, p. 411-426.

15816* (English.) **Studies in Ferrimetry. I. Determination of Arsenite With Ferric Alum Using Osmium Tetroxide and Iodine Monochloride as Catalysts. II. Determination of Hydroxylamine—Use of Copper Sulphate as Catalyst.** K. Bhaskara Rao and G. Gopala Rao. *Zeitschrift für Analytische Chemie*, v. 157, no. 2, 1957, p. 96-104.

15817* (English.) **Cerate-Chromate Oxidimetry. II. Estimation of Formic and Oxalic Acids in Their Mixtures.** N. N. Sharma. *Zeitschrift für Analytische Chemie*, v. 157, no. 2, 1957, p. 110-113.

Oxalic acid is oxidized to CO_2 and water with sulphatocerate in dilute H_2SO_4. Formic acid is not affected. Both are oxidized to CO_2 and water by the cerate-chromate reagent.

15818* (German.) Photometric Analysis of Titanium in Copper Alloys. **Photometrische Schnellbestimmung von Titan in Kupferlegierungen.** Hugo Wiedmann. *Zeitschrift für Metallkunde*, v. 48, July 1957, p. 410-412.

Chromotropic acid is used. Method also applies to steels and Al-alloys.

See also: **15596** (photometric determination of phosphorus); **15641** (identification of peptides in acid hydrolysates of α ACTH); **16347** (analysis of lubricating oil); **16522** (spectral analysis of slag and sintered ore); **16791** (sulfur and tetraethyl Pb in hydrocarbons); **17047** (tannins in Black Wattle barks).

CHEMISTRY—INORGANIC AND GENERAL

15819* (English.) **The Anion Exchange of Metal Complexes. The Silver-Thiosulphate System.** Y. Marcus. *Acta Chemica Scandinavica*, v. 11, no. 4, 1957, p. 619-627.

Batch equilibrations and column elutions gave silver distribution data between Dowex-1-thiosulfate resin and solutions of $Na_2S_2O_3$ in the concentration range 0.01 to 4 *M*. The thiosulfate concentrations in the resin in excess of its capacity were

measured, and the activity of thiosulfate ion in the resin calculated. This together with the distribution data yielded the "ideal" distribution curve.

15820* (English.) **On the Solubility Product of Precipitated Iron(III) Hydroxide.** George Biedermann and Paul Schindler. *Acta Chemica Scandinavica*, v. 11, no. 4, 1957, p. 731-740.

The solubility equilibrium of precipitated iron(III) hydroxide was investigated at 25 C by determining the [Fe^{3+}] and [H^+] of solutions in contact with the solid phase. The data obtained in this work and the experimental conditions for obtaining supersaturated solutions were discussed.

15821 The Thermal Decomposition of Uranium Peroxide, $UO_4.2H_2O$. James E. Boggs and Munzir EL-Chehabi. *American Chemical Society, Journal*, v. 79, Aug. 20, 1957, p. 4258-4261.

$UO_4.2H_2O$ decomposes slowly in the temperature range 90-195 C to form a different peroxide U_2O_7. The rate of this reaction was followed and the properties of U_2O_7 which has not been isolated previously was investigated.

15822 The $BF_3.N_2O_3$ Complex. Its Use in Diazotization and Nitration. G. Bryant Bachman and Takeo Hokama. *American Chemical Society, Journal*, v. 79, Aug. 20, 1957, p. 4370-4373.

Boron trifluoride reacts with N_2O_3 to form a stable, white, solid complex, $BF_3.N_2O_3$. Physical and chemical properties suggest that the structure is best represented as $(F_3B{\rightarrow}NO_2)$-$(NO)^+$. The complex is a weak nitrating agent but a powerful diazotizing agent in the aromatic series.

15823 Reactivity Studies of Uranium Oxides. Dale A. Vaughan, J. Robert Bridge, and Charles M. Schwartz. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-1205, July 1957, 14 p. (UF767 U3b Contin.)

One amorphous and three crystalline polymorphic modifications of UO_3 were prepared by pyrolysis of uranyl nitrate hexahydrate. Results showed that amorphous UO_3 is more reactive than crystalline UO_3.

15824 The Production of Titanium Trichloride by Arc-Induced Hydrogen Reduction of Titanium Tetrachloride. T. R. Ingraham, K. W. Downes, and P. Marier. *Canadian Journal of Chemistry*, v. 35, Aug. 1957, p. 850-859.

Hydrogen chloride was passed over heated Ti, and the regenerated H and $TiCl_4$ were recirculated to the arc. The method in effect utilizes the reducing power of the Ti metal to produce $TiCl_3$.

15825* (German.) Modes of Reaction of Cobalt-Carbonyl-Mercury and Other Metallic Cobalt-Carbonyls. **Über die Reaktionsweisen des Kobaltcarbonyl-Quecksilbers und anderer Metallkobaltcarbonyle.** Walter Hieber and Rudolf Breu. *Chemische Berichte*, v. 90, no. 7, 1957, p. 1259-1269.

Different modes are explained by the special form of bond of the complex ligands, especially in regard to the formation of a double bond structure.

15826* (French.) Chromium Arsenates. **Sur les arséniates de chrome.** Henri Guérin and Jeannine Masson. *Comptes Rendus*, v. 245, July 22, 1957, p. 429-431.

Fractional pyrolysis applied to monochromic arsenate. Chromium metaarsenate and chromium pyroarsenate were determined as well as the possible existence of the $Cr_2O_3 \cdot 2As_2O_5$ salt.

15827* (Italian.) Complexes of Bivalent Metals With Methyl Urea. **Complessi di metalli bivalenti con la metilurea.** Luigi Calvalca, Mario Nardelli, and Leandro Coghi. *Gazzetta Chimica Italiana*, v. 87, July-Aug. 1957, p. 903-906.

Chlorides of hexa-coordinated complexes of Mn^{II}, Ni^{II} and Co^{II} with methyl urea, $Me^{II}(CH_3NHCONH_2)_6Cl_2$, were prepared. These complexes had coordination bonds probably resembling those of the corresponding hexahydrates of octahedral coordination.

15828 Reduction With Complex Metal Hydrides. Norman G. Gaylord. *Journal of Chemical Education*, v. 34, Aug. 1957, p. 367-374.

A new class of inorganic reagents has found extensive acceptance and application by inorganic and organic chemists.

15829 The Valence States of the Elements V, Cr, Mn, Fe, Co, Ni, and Cu. H. A. Skinner and F. H. Sumner. *Journal of Inorganic and Nuclear Chemistry*, v. 4, nos. 5-6, 1957, p. 245-263.

Empirical atomic spectral parameters are obtained for various electronic configurations of the atoms in the period from V to Cu, and the excitation energies required to achieve some of the valence states of these atoms are calculated.

15830 Some Complex Chlorides of Uranium Tetrachloride and Thorium Tetrachloride. John R. Ferraro. *Journal of Inorganic and Nuclear Chemistry*, v. 4, nos. 5-6, 1957, p. 283-286.

The results of powder X-ray diffraction studies of these compounds are given, and the possibility of hydrates existing for the Th complexes is discussed.

15831 Tri-*n*-Butyl Phosphate as an Extracting Solvent for Inorganic Nitrates. II. Yttrium and the Lower Lanthanide Nitrates. D. Scargill, K. Alcock, J. M. Fletcher, E. Hesford, and H. A. C. McKay. **III. The Plutonium Nitrates.** G. F. Best, H. A. C. McKay, and P. R. Woodgate. **IV. Thorium Nitrate.** E. Hesford, H. A. C. McKay, and D. Scargill. *Journal of Inorganic and Nuclear Chemistry*, v. 4, nos. 5-6, 1957, p. 304-325.

Extractability increases with atomic number in the lanthanide series, with Y more extractable than any lanthanide at acidities $>c.$ 5 *M* HNO_3, though less extractable at low acidities. In the case of plutonium (IV) nitrate it was shown that the temperature coeffiicent of extraction is small, that salting out by sodium nitrate causes a striking increase in extraction, and that uranyl nitrate depresses the extraction. Thorium nitrate is more readily extracted by tri-*n*-butyl phosphate (TBP) than are the rare earths, but it is less extractable than plutonium (IV) nitrate by a factor of about 10.

15832 Nonmonotonic Ordering of Lanthanides in Tributyl Phosphate-Nitric Acid Extraction Systems. D. F. Peppard, W. J. Driscoll, R. J. Sironen, and S. McCarty. *Journal of Inorganic and Nuclear Chemistry*, v. 4, nos. 5-6, 1957, p. 326-333.

The partition of tracer-level lanthanides, Y, and Am between various tri-*n*-butyl phosphate (TBP) phases and aqueous nitric acid phases has been studied radiometrically as a function of solvent concentration, nitric acid concentration, and Z.

15833 The Extraction of Mercury(II) Iodide. Herbert C. Moser and Adolf F. Voigt. *Journal of Inorganic and Nuclear Chemistry*, v. 4, nos. 5-6, 1957, p. 354-357.

Radioactive tracer techniques were used to measure the extent of extraction at low mercury concentrations. With reasonable assumptions about activity coefficients the thermodynamic values of the constants for the formation of HgI_3^- and $HgI_4^=$ from HgI_2 and I^- were found to be 5.0×10^3 and 5.1×10^5, respectively.

15834* (Russian.) Effect of Soluble Admixtures on Crystallization of Ammonium Sulfate in By-Product Coke Industrial Conditions. **Vliianie rastvorimykh primesei na kristallizatsiiu sul'fata ammoniia v usloviiakh koksokhimicheskogo proizvodstva.** D. D. Taganovich. *Koks i Khimiia*, 1957, no. 7, p. 31-39.

Crystal shape of regular ammonium sulfate and method of investigation. Growth of ammonium sulfate crystals in pure solution and in the industrial mother liquor. Effect of admixtures of aluminum sulfate, FeO and Fe_2O_3, of addition of oxalic acid, of temperature, and of acidity on the saturated mother liquor. Elimination of Fe and Al admixtures from the mother liquor.

15835 The Preparation of High-Purity Calcium Oxide. Robert N. Roberts. *Los Alamos Scientific Laboratory (U. S. Atomic Energy Commission)*, LA-1936, Aug. 1957, 41 p. (UF 767 U3La Contin.)

A reliable method is described for the preparation of the high-purity calcium oxide required as base matrix of the standards used in the spectrochemical analysis of either Ca metal or the oxide.

15836 A Thermobalance Investigation of Starch as a Reducing Agent in the Conversion of Uranium Trioxide to Uranium Tetrafluoride. G. G. Briggs. *National Lead Company*

of Ohio, Technical Division (U. S. Atomic Energy Commission), NLCO-682, Aug. 1956, 34 p. (UF767 Un3.lnL Contin.)

The UO_3-starch pellets were reduced to UO_2 fairly rapidly at temperatures above 1100 F in an atmosphere of nitrogen. Some of the reduction appeared to take place at temperatures as low as 600 F. The UO_2 produced was very reactive towards subsequent hydrofluorination, but reduction temperatures exceeding 1300 F appeared to diminish this reactivity.

15837* Platinum Metals as Hydrogenation Catalysts. G. C. Bond. *Platinum Metals Review*, v. 1, July 1957, p. 87-93.

Metallic structure and activity; physical forms and the role of the support; hydrogenation of C=C and C=C bonds and other unsaturated functions.

15838 Resumé of Uranium Oxide Data. VI. J. Belle and L. J. Jones. *Westinghouse Electric Corporation, Atomic Power Division (U. S. Atomic Energy Commission)*, WAPD-PWR-PMM-466 (Del.), June 1956, 80 p. (UF767 Un3.1wa Contin.)

15839* (German.) The Chromium(III)-Arsenate-Water System. **Das System Chrom(III)/Arsenat/Wasser. II.** The Solid Phases of the System. **Die Bodenkörper des Systems.** A. Violet and Green Chromic(III) Orthoarsenates. **Das violette und das grüne Chrom(III)-orthoarsenat.** B. Solid Phases in Equilibrium With the Mother Liquor. **Die mit der Mutterlauge im Gleichgewicht befindlichen Bodenkörper.** Eberhart Baumgärtel. *Zeitschrift für Anorganische und Allgemeine Chemie*, v. 290, May 1957, p. 133-173.

15840* (German.) The Formation of Silicon-Nitrogen Compounds in Glow Discharge. **Über die Bildung von Silicium-Stickstoffverbindungen in der Glimmentladung. I.** Tri-Trichlorosilylamine $(SiCl_3)_3N$. **Das Tris-trichlorssilylamin $(SiCl_3)_3N$.** A. Pflugmacher and H. Dahmen. *Zeitschrift für Anorganische und Allgemeine Chemie*, v. 290, May 1957, p. 184-190.

See also: **16897** (oxidation of iron oxides).

CHEMISTRY—ORGANIC

15841* (English.) **Infrared Absorption Spectra of *ortho*- and *para*-Linked Polyphenyls.** Johannes Dale. *Acta Chemica Scandinavica*, v. 11, no. 4, 1957, p. 640-649.

The absorption spectra of biphenyl, *o*- and *p*-terphenyl, *o,o'*-, *o,p'*-, and *p,p'*-quaterphenyl were recorded from 2 to 25μ both in solution and in the solid state. The synthesis of *o,p'*-quaterphenyl is described.

15842* (German.) Structural Problems of Cotarnine Derivatives. **Strukturelle Probleme von Kotarninderivaten. I.** Reaction of Cotarnine With Sodium Bisulfite and Sulfurous Acid. **Die Reaktion des kotarnins mit natriumbisulfit und schwefliger säure.** Dénes Beke and Marietta Martos-Bárczai. **II.** The Structure of Condensation Products of Cotarnine Formed With Nitrogen Compounds. **Die Struktur der Kondensationsprodukte des Kotarnins mit Stickstoffverbindungen.** Dénes Beke and Kálmán Harsańyi. **III.** The Structure of "Hydrocotarnine-Acetic Acid". **Die Struktur der "Hydrokotarninessigsäure".** Dénes Beke, Kálmán Harsańyi, and Jenö Körösi. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 11, nos. 3-4, 1957, p. 295-316.

15843 Hydrogen Peroxide-Olefin Reactions in the Vapor Phase. E. R. Bell, W. E. Vaughan, and Frederick F. Rust. *American Chemical Society, Journal*, v. 79, Aug. 5, 1957, p. 3997-4000.

Hydrogen peroxide was decomposed in the presence of ethylene, propylene, and isobutylene at temperatures between 435 and 630 C. The products are traceable to an initial attack by hydroxy radical involving either addition to the double bond or abstraction of a H atom from the olefin.

15844 Free Radicals From the Heterogeneous Decomposition of Butane. Sydney W. Fleming and K. A. Krieger. *American Chemical Society, Journal*, v. 79, Aug. 5, 1957, p. 4003-4007.

A method which provides information about the nature of certain absorbed intermediates is described. Essentially it consists in observing the decomposition of a hydrocarbon (butane) into free radicals on a heated wire acting as a catalyst.

15845 Studies in Cöordination Chemistry. I. The Effect of Solvents on Some Bis-(N-Alkylsalicylalaldimine)-Nickel (II) Complexes. Luigi Sacconi, Piero Paoletti, and Giuseppe Del Re. **II. Spectrophotometric Investigation of Some Hydrazidic Tetracovalent Nickel(II) Complexes.** Luigi Sacconi, Piero Paoletti, and Francesco Maggio. *American Chemical Society, Journal*, v. 79, Aug. 5, 1957, p. 4062-4069.

15846 The Carbonyl Absorption of Carbamates and 2-Oxazolidones in the Infrared Region. S. Pinchas and D. Ben-Ishai. *American Chemical Society, Journal*, v. 79, Aug. 5, 1957, p. 4099-4104.

The data for the C=O frequency in 21 carbamates show that each type of a carbamic group has its own characteristic absorption region. Primary carbamates, both in the solid phase and in solution in chloroform, absorb at 1725 ± 3 $cm.^{-1}$. Secondary carbamates absorb at 1705-1722 and tertiary at 1687 ± 4 $cm.^{-1}$.

15847. The Kinetics of Ring Closure of Alkyl-Substituted 3,3-Dimethyl-5-keto-Hexanoic Acids by Sulfuric Acid. W. E. Silbermann and T. Henshall. *American Chemical Society, Journal*, v. 79, Aug. 5, 1957, p. 4107-4114.

Results are consistent with a reaction sequence in which the rate-controlling stage is electrophilic attack by C_1^+ on the double bond of the enolized form of the keto-acid.

15848 Chemistry of the 1,4-Diamino-1,3-Butadienes. I. Preparation. II. A New Synthesis of N-Substituted Pyrroles. Marian F. Fegley, Newman M. Bortnick, and Charles H. McKeever. *American Chemical Society, Journal*, v. 79, Aug. 5, 1957, p. 4140-4146.

15849 Perfluoroalkylzinc Compounds. I. The Preparation and Properties of Perfluoroalkylzinc Halides. William T. Miller, Jr., Elliot Bergman, and Arnold H. Fainberg. *American Chemical Society, Journal*, v. 79, Aug. 5, 1957, p. 4159-4164.

15850 The Relative Reactivities of Substituted Toluenes Toward Chlorine Atoms. Cheves Walling and Bernard Miller. *American Chemical Society, Journal*, v. 79, Aug. 5, 1957, p. 4181-4187.

15851 The Displacement of Aromatic Substituents by Halogen Atoms. Bernard Miller and Cheves Walling. *American Chemical Society, Journal*, v. 79, Aug. 5, 1957, p. 4187-4191.

Evidence that the reaction of Cl with bromobenzene to give chlorobenzene and Br is a radical chain process.

15852 Heterocyclic Compounds. IV. The Structures of 2-Phenylpyrroline and 2,4-Diphenylpyrroline. Milton C. Kloetzel, Jack L. Pinkus, and Robert W. Washburn. **V. β-Pyridyl β-Styryl Ketone.** Milton C. Kloetzel and Francis L. Chubb. *American Chemical Society, Journal*, v. 79, Aug. 5, 1957, p. 4222-4229.

15853 Quinazolinediones From Aromatic Amines and Carbon Dioxide. T. L. Cairns, D. D. Coffman, and W. W. Gilbert. *American Chemical Society, Journal*, v. 79, Aug. 20, 1957, p. 4405-4408.

The reaction of CO_2 with certain primary aromatic amines at 8500 atm. and 200-250 C has given high conversions to 3-aryl-2,4(1H,3H)-quinazolinediones (I). A sharp pressure threshold for the reaction was found at about 3300 atm.

15854 Rearrangement of Ketones in Acid Media. Harry D. Zook, Warren E. Smith, and Janice L. Greene. *American Chemical Society, Journal*, v. 79, Aug. 20, 1957, p. 4436-4439.

A single product or an equilibrium mixture of a single product and the original ketone is obtained. The positions of the equilibria are qualitatively in accord with resonance and hyperconjugation theories.

15855* The Preparation of Aromatic Aldehydes. V. Kurt Kulka. *American Perfumer and Aromatics*, v. 70, Aug. 1957, p. 45 + 4 pages.

A discussion of those preparations of aromatic aldehydes whereby a functional group connected to the aromatic ring is converted to the formyl group.

15856* (German.) Recent Methods in Preparative Organic Chemistry. **Neuere Methoden der präparativen organischen Chemie. VIII.** Amidomethylations. **Amidomethylierungen.** H. Hellmann. *Angewandte Chemie*, v. 69, July 15, 1957, p. 463-471.

The various possibilities of the substitution of an H-atom with an amido-methyl radical (R-CO-NH-CH_2-) are described, the reaction mechanisms predominating in each case discussed and the fields of application outlined.

15857* (German.) Studies on the Process of Substitution. **Studien zum Ablauf der Substitution. XII.** Rearrangement and Thermal Decomposition of Acylated Hydroxylamines. **Umlagerung und thermischer Zerfall acylierter Hydroxylamine. XIII.** The Existence of Transitional Radicals in the Reaction of Dibenzoyl Peroxide With Aliphatic-Aromatic Substitute Secondary Amines. **Zur Existenz von Durchgangsradikalen bei der Umsetzung von Dibenzoylperoxyd mit aliphatisch-aromatisch substituierten sek Aminen.** Leopold Horner and Hartmut Steppan. *Annalen der Chemie*, v. 606, nos. 1-3, 1957, p. 24-55.

15858* (German.) Reaction of Acetyl Sulfur Chloride With Diazomethane. **Über die umsetzung von acetyl-schwefelchlorid mit diazomethan.** Horst Böhme and Hans-Dietrich Stachel. *Annalen der Chemie*, v. 606, nos. 1-3, 1957, p. 75-79.

Experiment yielded β-chloroethyl acetyl disulfide instead of the expected chloromethyl acetyl sulfide.

15859* (German.) The Diels-Alder Reaction. **Diels-Alder-Reaktion. IV.** The Reaction of Several Phenols With Maleic Anhydride. **Über die reaktion einiger phenole mit maleinsäureanhydrid.** Ken'ichi Takeda and Keizo Kitahonoki. *Annalen der Chemie*, v. 606, nos. 1-3, 1957, p. 153-160.

15860* (German.) Sodium Triethoxy-Aluminum Hydride. A New Reducing Agent in Organic Chemistry. **Natriumtriäthoxy-aluminiumhydrid, ein neues Reduktionsmittel in der organischen Chemie.** Gerhard Hesse and Rudolf Schrödel. *Annalen der Chemie*, v. 607, nos. 1-3, 1957, p. 24-35.

The complex, soluble in ethers of sodium hydride and aluminum ethylate, $Na[Al(OC_2H_5)_3H]$, is a suitable reducing agent for organic materials with polar multiple compounds. Reaction with lithium alanate. Reduction of aromatic nitriles to aldehydes.

15861* (German.) Contribution to the Knowledge of the Macrocylic Systems. **Zur Kenntnis der makrocyclischen Ringsysteme. III.** A Simple Method for Producing Macrocyclic Diamides. **Eine einfache methode zur herstellung makrocyclischer diamide.** Hermann Stetter and Joachim Marx. *Annalen der Chemie*, v. 607, nos. 1-3, 1957, p. 59-66.

Making macrocyclic diamides of any ring size by the condensation of α, ω-diamines with dicarboxylic acid. The diamides were reduced to the corresponding diimines by reduction with Li alanate.

15862* (French.) New Pyrylocyanines Obtained by the Acid Hydration of Symmetric Polyalkynyl Carbinols. **Sur des pyrylocyanines nouvelles obtenues par hydratation acide de polyalkynylcarbinols symétriques.** Michel Siemiatycki. *Annales de Chimie (Paris)*, v. 2, Mar.-Apr. 1957, p. 189-232 + 2 plates.

Production of new dyestuffs. Hydration of Tripropynylcarbinol, bisphenethynyl carbinol and of triphenethynyl carbinol.

15863 Atisine: Further Degradation. D. Dvornik and O. E. Edwards. *Canadian Journal of Chemistry*, v. 35, Aug. 1957, p. 860-872.

Oxazolidine rings of atisine and isoatisine were removed by a novel Hofmann-type reaction, giving a C_{20}-azomethine alcohol. Atisine was resynthesized from this, locating the azomethine double bond and the oxazolidine relative to each other.

15864 Dow Refines Structural Searching. Ascher Opler. *Chemical and Engineering News*, v. 35, Aug. 19, 1957, p. 92-96.

New approaches to machine searching; cost per search decreases rapidly with increasing size of the computer; search work based on the IBM 704, a digital computer.

15865 The Preparation and Properties of Phosphonic Acids. Leon D. Freedman and G. O. Doak. *Chemical Reviews*, v. 57, June 1957, p. 479-524.

15866* (English.) **Polymorphism of Bis-β-Hydroxyethyl Terephthalate.** Akihisa Miyake. *Chemical Society of Japan, Bulletin*, v. 30, June 1957, p. 361-363.

Differences occur mainly from the difference in configuration of the side chain attached to the benzene ring.

15867 Preparation and Reactions of Thiocarbamoyl- and Thioureidoamidines. C. G. Raison. *Chemical Society, Journal*, 1957, July, p. 2858-2861.

Ethoxymethylenearylamines and thiosemicarbazide give *N*-thioureido-*N'*-arylformamidines; various ring-closure reactions of these products are discussed.

15868 Aromatic Arylalkylation. I. The Triphenylmethylation of *o*-Cresol in Sulphuric Acid-Acetic Acid. T. G. Bonner, J. M. Clayton, and Gwyn Williams. *Chemical Society, Journal*, 1957, July, p. 2867-2872.

15869 Stereochemistry of *cyclo*Hexane Derivatives. VI. The 3-Aminocyclohexanols. R. R. Burford, F. R. Hewgill, and P. R. Jefferies. *Chemical Society, Journal*, 1957, July, p. 2937-2942.

15870 Molecular Rearrangements. I. *N*-Chloracetanilide. K. N. Ayad, C. Beard, R. F. Garwood, and W. J. Hickinbottom. *Chemical Society, Journal*, 1957, July, p. 2981-2986.

N-Chloroacetanilide rearranges to *o*- and *p*-chloroacetanilide in hot CCl_4 in the absence of light, if a small quantity of benzoyl peroxide is present. *N*-Chloro-derivatives of *o*-, *m*-, and *p*-acetamidotoluene and of *o*-acetamidoethylbenzene similarly rearrange.

15871 The Preparation of Some Trinitrophenylpyrazoles. I. L. Finar and R. J. Hurlock. *Chemical Society, Journal*, 1957, July, p. 3024-3027.

1-Phenylpyrazole and nitrophenylpyrazoles were converted into trinitro-compounds by mixed acids at 100 C and the products orientated by synthesis. Some di- and the tri-nitrophenylpyrazoles give colors in the Janovsky reaction.

15872 Amine Oxidation. I. The Side-Chain Oxidation of *N*-Alkyl- and *NN*-Dialkyl-Anilines by Manganese Dioxide. H. B. Henbest and A. Thomas. *Chemical Society, Journal*, 1957, July, p. 3032-3039.

15873 Spirocyclic Compounds. I. The Preparation of Compounds Related to 3:2'-Dioxogrisan. F. M. Dean and Kamchorn Manunapichu. *Chemical Society, Journal*, 1957, July, p. 3112-3123.

15874 Properties and Reactions of Free Alkyl Radicals in Solution. IX. Synthesis and Reactions of Some Tertiary Nitroalkanes. J. F. Tilney-Bassett and William A. Waters. *Chemical Society, Journal*, 1957, July, p. 3129-3134.

Nitrogen dioxide combines with tertiary aliphatic free radicals in solution to give nitroalkanes. α-Nitro*iso*butyronitrile and its analogs are decomposed by caustic alkali, alcoholic cyanide, and lithium aluminum hydride with loss of the nitrile group.

15875 Indoles. V. The Fischer Cyclisation of Some *Meta*-Substituted Arylhydrazones. D. W. Ockenden and K. Schofield. *Chemical Society, Journal*, 1957, July, p. 3175-3180.

Substituents which, in electrophilic substitution, are *ortho-para*-directing produce a preponderance of 6-- over 4-substituted indoles. The reverse is usually true of *meta*-directing groups.

15876 The Synthesis of 3:4-Benzofluorene and Some of Its Monomethyl Derivatives. B. R. T. Keene and K. Schofield. *Chemical Society, Journal*, 1957, July, p. 3181-3186.

15877 Butadienes and Related Compounds. IV. A Study of the Mechanism of Formation of 1:1:4:4-Tetra-Arylbuta-1:3-Dienes. Wadie Tadros and Alfy Badie Sakla. *Chemical Society, Journal*, 1957, July, p. 3210-3217.

15878 Mesomorphism and Chemical Constitution. IX. The Preparation and Mesomorphic Behaviour of the 7-*n*-Alkoxy-Fluorene- and Fluorenone-2-Carboxylic Acids and Their *n*-Propyl Esters. G. W. Gray and A. Ibbotson. *Chemical Society, Journal*, 1957, July, p. 3228-3235.

15879 Experiments in the *cyclo*Butane Series. III. Attempts to Obtain Optically Active Substituted 1:2-Dimethyleneecyclobutanes. IV. The Interaction of Diethyl *cis-cyclo* Butane-1:2-Dicarboxylate With Phenylmagnesium Bromide.

F. B. Kipping and J. J. Wren. *Chemical Society, Journal*, 1957, July, p. 3246-3255.

15880* (German.) The Reduction of Nitro-Benzol by Carbon Monoxide Under Technical Conditions. **Die Reduktion des Nitrobenzols wit Kohlenoxyd unter technischen Bedingungen.** F. Glaser and R. Van Beneden. *Chemie-Ingenieur-Technik*, v. 29, Aug. 1957, p. 512-517.

The reaction apparently occurs via the intermediate product azo-dioxy-benzol to azoxy-benzol and azo-benzol. Small quantities of water greatly affect the reaction.

15881* (German.) Nitroso Compounds. **Über Nitrosoverbindungen. VI.** Photochemical Nitrozation of Aliphatic and Cycloaliphatic Hydrocarbons With Nitrogen Monoxide and Chlorine. **Zur photochemischen Nitrosierung aliphatischer und cycloaliphatischer Kohlenwasserstoffe mit Stickstoffmonoxyd und Chlor. VII.** The Effect of Light on the Conversion of Secondary Cycloaliphatic Binitroso Compounds to Oximes With Hydrochloric Acid. **Über die Einwirkung von Licht auf die Umwandlung von sek cycloaliphatischen Bis-Nitrosoverbindungen zu Oximen mit Chlorwasserstoff.** Horst Metzger and Eugen Müller. **VIII.** Direct Oximation of Cycloaliphatic Hydrocarbons. **Direkte Oximierung Cycloaliphatischer Kohlenwasserstoffe.** Eugen Müller, Dorla Fries, and Horst Metzger. *Chemische Berichte*, v. 90, no. 7, 1957, p. 1179-1201.

15882* (German.) The Nef Reaction. **Zur Kenntnis der Nef-Reaktion. II.** A New Furan Ring Synthesis. **Uber eine neue Furanring-Synthese.** Friedrich Boberg and Georg Richard Schultze. *Chemische Berichte*, v. 90, no. 7, 1957, p. 1215-1225.

15883* (German.) Homologous α-Ketoaldehydes From Carbonic Acids. **Homologe α-Ketoaldehyde aus Carbonsäuren.** Friedrich Weygand and Hans Jürgen Bestmann. *Chemische Berichte*, v. 90, no. 7, 1957, p. 1230-1234.

Obtained with Br via the diazoketones and the α-ketoaldehyde-diethylmercaptals.

15884* (German.) Studies in the Vitamin D Series. **Studien in der Vitamin D-Reihe. XXIII.** Building *trans*-Hydrindan Ketones From Vitamin D_3 to the Vinylogous Aldehyde. **Aufbau des *trans*-Hydrindan-ketons aus Vitamin D_3 zum vinylogen Aldehyd.** *Chemische Berichte*, v. 90, no. 7, 1957, p. 1283-1286.

15885* (German.) Studies of Diazomethanes. **Untersuchungen an Diazomethanen. VII.** The Reaction of Diazomethane With Methyllithium. **Zur Kenntnis der Umsetzung von Diazomethan mit Methyllithium. VIII.** A New Synthesis of Diazomethane and Isodiazomethane. **Eine neue Synthese von Diazomethan und von Isodiazomethan.** Eugen Müller and Wolfgang Rundel. *Chemische Berichte*, v. 90, no. 7, 1957, p. 1299-1306.

15886* (German.) Heterocyclic Fulvenes. **Über heterocyclische Fulvene. I.** Synthesis of 6-Furyl-(2)-Fulvene and of Two Vinyl Homologs. **Synthesen des 6-Furyl-(2)-fulvens und zweier Vinylen-Homologen.** Carl Heinz Schmidt. *Chemische Berichte*, v. 90, no. 7, 1957, p. 1352-1356.

Production of three pure compounds characterized by great instability.

15887* (Spanish.) Reactions of Propylene With Mercury Salts. **Reacciones del propileno con sales mercúricas.** J. L. Martinez Cordon and Vincente Gomez Aranda. *Combustibles*, v. 17, Mar.-Apr. 1957, p. 83-103.

Mercuration reactions were studied by means of the Hoffmann method, the free acid process, and by using a mercuric oxide + acid system. A satisfactory method was developed. The participation of the basic Hg salts during the reaction was stressed.

15888* (French.) Products of Reduction of α, α-Diphenyl-Glutaric Acid. **Sur les produits de réduction de l'acide α, α-diphényl-glutarique.** François Salmon-Legagneur, Cécile Neveu, and Michel Derrien. *Comptes Rendus*, v. 245, July 17, 1957, p. 320-322.

Reducing α, α-diphenyl glutaric anhydride by means of $LiAlH_4$ in a dioxane solution yielded diphenyl-2, 2-pentanediol -1,5 with no intermediate lactone.

15889* (French.) Hydrolysis of α-Aminonitriles by Means of Lithium Aluminum Hydride. Directing the Reduction Towards Hydrolysis by Means of Aluminum Chloride. **Sur la coupure des α-aminonitriles par l'hydrure de lithium et d'aluminium. L'orientation de la réduction au moyen de chlorure d'aluminium vers la réaction de coupure.** Geneviève Le Ny and Zoltan Welvart. *Comptes Rendus*, v. 245, July 22, 1957, p. 434-436.

The reduction of the α-aminonitriles by $LiAlH_4$ can be directed towards hydrolysis by increasing the electrophilic character of the reducing agent by addition of $AlCl_3$.

15890* (Russian.) Role of Complex Compounds and Cations of Complex-Forming Components in the Polymerization of Acetylene. **Rol' kompleksnykh soedinenii i kationov kompleksoobrazuiushchikh komponentov v reaktsii polimerizatsii atsetilena.** A. L. Klebanskii, I. M. Dolgopol'skii, and Z. F. Dobler. *Doklady Akademii Nauk SSSR*, v. 114, May 11, 1957, p. 323-326.

Variation in pH of a CuCl-MCl solution during absorption of acetylene hydrocarbons in relation to concentration of the solution components. Effect of solution acidity on degree of ionization and rate of acetylene polymerization. Activity of the catalytic solutions in relation to the nature of the cation (MCl).

15891 Foaming Agents in Cosmetics. Karl Bergwein. *Drug and Cosmetic Industry*, v. 81, Aug. 1957, p. 163 + 4 pages.

Use anionic alkyl aryl sulfonates in shampoos to overcome formation of insoluble lime soaps and strongly alkaline solutions characteristic of ordinary soap when used with hard water.

15892* (German.) Recent Results With Synthesis of Branched Fatty Acids. **Über neuere bei der Synthese verzweigter Carbonsäuren erzielt Ergebnisse.** H. Koch. *Fette, Seifen, Anstrichmittel*, v. 59, July 1957, p. 493-498.

Reaction mechanism of the addition of CO and water to olefins in two stages. Use of formic acid as source of CO. Progress of working with CO under pressure.

15893* (German.) Application of Electron Microscopy in Studies of Fats. **Anwendung der Elektronen-Mikroskopie auf dem Fettgebiet. II.** H. P. Kaufmann, E. Gulinsky, and M. Vogelmann. *Fette, Seifen, Anstrichmittel*, v. 59, July 1957, p. 522-525.

By means of light- and electron microscopy, in thin films of drying oils crystalline segregations were examined that are partly formed spontaneously and partly produced by addition of fatty acids and waxes. A form of "blooming" connected with chlorophyll-(phaeophytin-) content of oils was observed.

15894* Studies on the Synthesis of Phenylchlorosilanes. I. The Synthesis of Phenylsilanes by the Wurtz-Fittig Reaction. Yasuo Takami. *Government Chemical Industrial Research Institute, Tokyo, Reports*, v. 52, May 1957, p. 179-185.

Ethyl acetate is the effective activator of sodium in the one-stage reaction. A "dropping" method is used to eliminate the accumulation of heat of reaction; one-stage dropping method is superior to the two-stage method for the preparation of $PhSiCl_3$ and Ph_2SiCl_2.

15895 Impurities in Petroleum. 73 p. 1955. Petreco, Long Beach, Calif. (TP691 P44.8i)

Occurrence, analysis, and significance to refiners.

15896 Investigations on Organo-Tin Compounds. VII. The Addition of Organo-Tin Hydrides to Olefinic Double Bonds. VIII. Preparation of Some Organo-Tin Hydrides. IX. The Preparation of Some Dialkyltin Compounds With Long-Chain Alkyl Groups. G. J. M. Van Der Kerk, J. G. Noltes, and J. G. A. Luijten. *Journal of Applied Chemistry*, v. 7, July 1957, p. 356-374.

A new method for the synthesis of tin-carbon bonds is described. Describes preparation and properties of some di-*n*-hexyl, di-*n*-octyl, bis-(2-ethyl-*n*-hexyl)- and bis-(3 : 5 : 5-trimethyl-*n*-hexyl) tin compounds, potentially interesting as non-toxic stabilizers for vinyl plastics.

15897 Attempted Syntheses of Compounds Containing the 1,6-Diazacyclodecapentaene Ring. A. E. Blood and C. R. Noller. *Journal of Organic Chemistry*, v. 22, Aug. 1957, p. 873-876.

15898 Studies of Quinoid Structures. I. Action of Arylmagnesium Halides on Phenanthrenequinonimine. William Ibrahim Awad and Abdel Rehim Abdel Raouf. *Journal of Organic Chemistry*, v. 22, Aug. 1957, p. 881-884.

15899 Lithium in Ethylenediamine: A New Reducing System for Organic Compounds. Leslie Reggel, R. A. Friedel, and Irving Wender. *Journal of Organic Chemistry*, v. 22, Aug. 1957, p. 891-894.

New metal-amine system reduces aromatic rings to monoölefins and to cycloparaffins; reduces phenols, cleaves ethers; reduces ketones to alcohols; and reduces acetylenes and both terminal and internal olefins to alkanes.

15900 Derivatives of Ferrocene. I. The Metalation of Ferrocene. II. Some Reduction Products of Benzoylferrocene and 1-1'-Dibenzoylferrocene. Marvin Rausch, Martin Vogel, and Harold Rosenberg. *Journal of Organic Chemistry*, v. 22, Aug. 1957, p. 900-906.

New derivatives of ferrocene; various synthetic methods by which substituted ferrocenes are made; action of several reducing agents on aryl ferrocenyl ketones.

15901 *N*- and *C*-Benzoylation of *p*-Aminoacetophenone With Methyl Benzoate by Sodium Amide. Synthesis of β-Diketones Having *p*-Acylamino and *p*-Hydroxy Groups. Charles R. Hauser and Charles J. Eby. *Journal of Organic Chemistry*, v. 22, Aug. 1957, p. 909-912.

These condensations furnish a significant extension of the Claisen method of synthesis of β-diketones.

15902 Physical Properties of the Aminoazobenzene Dyes. VII. Absorption Spectra of 4-Aminoazobenzene Dyes in Ethanol. Eugene Sawicki. *Journal of Organic Chemistry*, v. 22, Aug. 1957, p. 915-919.

Visible absorption spectra of approximately 60 azobenzene derivatives in 95% ethanol were investigated. Relative intensity of two adjacent bands in chloro-, methoxy-, methylthio-, and amino derivatives of 4-dialkylaminoazobenzenes is solvent dependent.

15903 Alkylated 5-Aminotetrazoles, Their Preparation and Properties. Douglas F. Percival and Robert M. Herbst. *Journal of Organic Chemistry*, v. 22, Aug. 1957, p. 925-933.

Attempt made to correlate the physical and chemical properties of the alkylated 5-aminotetrazoles with the tautomeric and resonance possibilities inherent in the several groups.

15904 Reactions of Limonene Monoxide. The Synthesis of Carvone. Seymour M. Linder and Frank P. Greenspan. *Journal of Organic Chemistry*, v. 22, Aug. 1957, p. 949-951.

Study of the conversion of D-limonene into L-carvone. Two successful methods were developed, one by the pyrolysis of limonene glycol diacetate, and the other the oxidation of limonene glycol with *tert*-butyl chromate.

15905 Foam Stabilizing Additives for Synthetic Detergents. Interaction of Additives and Detergents in Mixed Micelles. M. J. Schick and F. M. Fowkes. *Journal of Physical Chemistry*, v. 61, Aug. 1957, p. 1062-1068.

Addition of a small amount of certain non-ionic surface active agents to anionic detergents is shown to enhance foam stability. The causes of the specificity and the structural relationship of effective combinations of additives and detergents were investigated by a study of their mixed micelles. The additives which lowered the critical micelle concentration the most were in general the most effective for enhancing foam stability; these were compounds having an unbranched paraffin chain equal in length to the detergent, and with highly hydrophilic non-ionic polar groups at one end.

15906* Nuclear Methylation of Coumarins. V. N. Gupta and T. R. Seshadri. *Journal of Scientific & Industrial Research*, v. 16, sec. B, June 1957, p. 257-262.

Results indicate that the coumarin ring opens partially at 0° and fully in hot methanolic alkali and the resulting cinnamic acid derivatives undergo nuclear methylation like the carbonyl derivatives of resorcinol and phloroglucinol.

15907* Sesquiterpenes From Indian Vetiver (Khus) Oil. N. L. Zutshi and Sadgopal. *Perfumery and Essential Oil Record*, v. 48, July 1957, p. 333-340.

A detailed chemical examination of the various sesquiterpene fractions of the oil.

15908* (English.) **Association of Fatty Acids in the Liquid Phase.** D. Szabo Sarkadi and J. H. De Boer. *Recueil des Travaux Chimiques des Pays-Bas*, v. 76, July 1957, p. 628-646.

Association was measured by an infra-red spectrophotometric method, using high paraffins as solvent. Chain length, the presence of one or two double bond, and the branching of the chain have no influence on the association.

15909* (English.) **The Action of *p*-Toluenesulphonyl Chloride on Pyridine-N-Oxide. II. The Reaction of Pyridine-N-Oxide With 2-, 3- and 4-Pyridyl *p*-Toluenesulphonate.** P. A. De Villiers and H. J. Den Hertog. *Recueil des Travaux Chimiques des Pays-Bas*, v. 76, July 1957, p. 647-656.

15910* Investigations on Agricultural Fungicides. II. Compounds Structurally Related to Trichloromethyl Thiolsulphonates. III. The Reaction Between Trichloromethanesulphenyl Chloride and Benzoic Acid. J. H. Uhlenbroek and M. J. Koopmans. *Recueil des Travaux Chimiques des Pays-Bas*, v. 76, July 1957, p. 657-668.

15911 The Catalytic Deuteration and Exchange of Acetone on Evaporated Metal Films. C. Kemball and C. T. H. Stoddart. *Royal Society, Proceedings*, v. 241, ser. A, Aug. 7, 1957, p. 208-222.

A correlation is obtained between the activity of the metals for the exchange of acetone and the percentage *d*-character of the metallic bonds.

15912* (Russian.) Radical and Ion Mechanism of Alkylation of Aromatic Nucleus. **Radikal'nyi i ionnyi mekhanizm alkilirovaniia aromaticheskogo iadra. V.** Benzylation of Naphthalene. **Benzilirovanie naftalina.** I. P. Tsukervanik and G. S. Semeshko. *Zhurnal Obshchei Khimii*, v. 27, May 1957, p. 1143-1146.

By condensing naphthalene with benzyl chloride, α-benzylnaphthalene is formed in cases when a non-ionic reaction mechanism is possible. Using $AlCl_3$ as catalyst, β-benzylnaphthalene was obtained. In the presence of small quantities of Cu at 80-90 C, 60% of α-benzylnapthalene was produced.

15913* (Russian.) Alkylation in Aqueous Medium in the Presence of Quaternary Ammonium Salts. **Alkilirovanie v vodnoi srede v prisutstvii, chetvertichnykh ammonievykh solei. III.** A. T. Babain and M. G. Indzhikian. *Zhurnal Obshchei Khimii*, v. 27, May 1957, p. 1201-1206.

The yield increases with decrease of basicity and with the addition of halide salts of alkali metals.

15914* (Russian.) Snythesis of Polymethyldimethylsiloxenes. **Sintez polimetildimethilsiloksanov.** K. A. Andrianov and V. M. Mantrova. *Zhurnal Obshchei Khimii*, v. 27, May 1957, p. 1243-1249.

15915* (Russian.) Synthesis and Properties of Tri-Substituted α-Naphthylsilane Derivatives. **Sintez i svoistva trekhzameshchennykh proizvodnykh α-naftilsilana.** P. S. Sanin. *Zhurnal Obshchei Khimii*, v. 27, May 1957, p. 1286-1290.

15916* (Russian.) Halogenating Aromatic Silanes. **Galoidirovanie aromaticheskikh silanov. IV.** Preparation and Properties of *n*-Tolyltrichlorosilane, Chloro- and Bromo- Derivatives. **Poluchenie i svoistva khlor- i bromproizvodnykh *n*-tolilt-rikhlorsilana.** G. V. Motsarev and A. Ia. Iakubovich. *Zhurnal Obshchei Khimii*, v. 27, May 1957, p. 1318-1330.

See also: **15622** (commercial microbiological conversions of steroids); **15632** (streptomycin and enzymic reactions in carbohydrates); **15645** (synthesis of potential anticancer agents); **15732** (the hydroxamic acid-ferric ion complex in quantitative analysis); **16943** (polymerization of benzyl and its perchlorates); **17018** (oxidation of sodium-divinyl rubber ozonide); **17034** (alcoholysis of lignin).

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15917* (English.) **On the Kinetics of the Oxidation of Hydrocarbons. III. Effect of Water and Iodine on the Oxidation of Ethane. IV. Effect of Methylamine and**

Nitrogen Dioxide on the Oxidation of Ethane. V. The Non-Catalytic Oxidation of Ethylene. VI. Effect of Homogeneous Catalysts on the Oxidation of Ethylene. VII. Oxidation of Acetylene and Effect of Homogeneous Catalysts on the Oxidation. Zoltán G. Szabó and Dezső Gál. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 11, nos. 3-4, 1957, p. 205-270.

15918* (English.) **On the Approximate Calculation of Critical Pressures of Liquids.** Péter Móritz. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 11, nos. 3-4, 1957, p. 271-276.

Critical pressures of liquids may be calculated on the basis of the additivity of logarithms of critical pressures. Atomic-, group- and bond-increments of the logarithms of critical pressures are listed.

15919* (English.) **Determination of Adsorption Isotherms by Frontal Gas Chromatography.** Géza Schay, P. Fejes, I. Halász, and J. Király. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 11, nos. 3-4, 1957, p. 381-393.

15920* (English.) **Mercury(II) Halide Mixed Complexes in Solution. II. Complexity Constants of the Binary Complexes. III. The Uncharged Mixed Complexes.** Y. Marcus. *Acta Chemica Scandinavica*, v. 11, no. 4, 1957, p. 599-618.

Complexity constants for mercury(II) halide complexes were determined by solvent distribution for 0.50 *M* $NaClO_4$ ionic medium and 25 C. The equilibrium constant *K* of the reaction $HgA_2 + HgB_2 \rightleftharpoons 2HgAB$ was determined by studying the distribution of Hg between benzene and an aqueous solution.

15921* (English.) **Ultraviolet Absorption Spectra of *ortho*- and *para*-Linked Polyphenyls.** Johannes Dale. *Acta Chemica Scandinavica*, v. 11, no. 4, 1957, p. 650-659.

The observed bands have been tentatively interpreted and factors of importance for the development of vibrational structure briefly discussed. Interplanar angles in the solid state have been considered in relation to intermolecular forces which seem to favor mutually perpendicular orientation of ring planes in adjacent molecules.

15922 Infrared Spectra of α,β-Unsaturated Esters. W. L. Walton and R. B. Hughes. *American Chemical Society, Journal*, v. 79, Aug. 5, 1957, p. 3985-3992.

A number of ester families are shown to have characteristic absorptions in the 10-15 μ region. These absorptions are quite constant in wave length for all members of the ester family. The esters which show such absorptions are those that have unsaturation α,β - to the ester group.

15923 The Evaluation of Inductive and Resonance Effects in Reactivity. II. Thermodynamic Properties of Hydrogenation of Non-Conjugated Olefins, Aldehydes, and Ketones. III. Extra Resonance Energies of Conjugation. Robert W. Taft, Jr. and M. M. Kreevoy. *American Chemical Society, Journal*, v. 79, Aug. 5, 1957, p. 4011-4021.

15924 Kinetics of Reactions Involving Neptunium(IV), Neptunium(V) and Neptunium(VI) Ions in Sulfate Media. J. C. Sullivan, Donald Cohen, and J. C. Hindman. *American Chemical Society, Journal*, v. 79, Aug. 5, 1957, p. 4029-4034.

15925 Heats of Formation of Potassium Chromate, Potassium Dichromate, Chromate and Dichromate Aqueous Ions. Entropy of Dichromate Ion. C. N. Muldrow, Jr. and L. G. Hepler. *American Chemical Society, Journal*, v. 79, Aug. 5, 1957, p. 4045-4048.

15926 Heats of Hydrogenation. I. Apparatus and the Heats of Hydrogenation of Bicyclo [2,2,1] Heptene, Bicyclo [2,2,1] Heptadiene, Bicyclo [2,2,2] Octene and Bicyclo [2,2,2] Octadiene. II. Heats of Hydrogenation and the Acid-Catalyzed Isomerization of Some Unsaturated Steroids. III. Hydrogenation of Cycloöctatetraene and of Some Seven-Membered Non-Benzenoid Aromatic Compounds. IV. Hydrogenation of Some *cis*- and *trans*-Cycloölefins. Richard B. Turner, et al. *American Chemical Society, Journal*, v. 79, Aug. 5, 1957, p. 4116-4136.

15927 Absorption Spectra of Heterocyclic Compounds. VII. Some 3(2H)-Pyridazones. Edgar A. Steck and Frederick C. Nachod. *American Chemical Society, Journal*, v. 79, Aug. 20, 1957, p. 4408-4411.

Absorption spectra of a series of 3-pyridazones are reported and interpreted.

15928 Pyridine: Experimental and Calculated Chemical Thermodynamic Properties Between 0 and 1500 K.; Revised Vibrational Assignment. J. P. McCullough, et al. *American Chemical Society, Journal*, v. 79, Aug. 20, 1957, p. 4289-4295.

From studies by low-temperature calorimetry, comparative ebulliometry, flow calorimetry and combustion calorimetry, values were obtained for the entropy, heat capacity and heat of formation of pyridine in the ideal gaseous state. The calorimetric values of entropy and heat capacity served as guides in revising the vibrational assignments for pyridine and several deuteropyridines.

15929* The Temperature Dependence of the Microwave Dispersion of Some Mono-Substituted Benzenes. A. J. Van Eick and J. Ph. Poley. *Applied Scientific Research*, v. 6, sec. B, no. 5, 1957, p. 359-368.

The results of a series of microwave measurements on C_6H_5Cl and C_6H_5Br between −20 and +60 C.

15930* Deuterium Exchange of Poly-DL-Alanine in Aqueous Solution. Arieh Berger and K. Linderstrom-Lang. *Archives of Biochemistry and Biophysics*, v. 69, July 1957, p. 106-118.

The reaction is catalyzed by both hydrogen and hydroxyl ions, and the slow exchange may be explained by a stabilization of the helix due to internal nonpolar bonds between the methyl groups of the side chains.

15931 Mass Transfer in a Continuous-Flow Mixing Vessel. Virgil G. Trice, Jr. *Argonne National Laboratory (U. S. Atomic Energy Commission)*, ANL-5741, July 1957, 43 p. (UF767 Un3.1an Contin.)

A relationship was obtained which is in fundamental agreement with correlations developed by investigators using other types of liquid-liquid contacting apparatus. Isobutanol despersed in H_2O and nitrobenzene dispersed in ethylene glycol were studied.

15932* Hyperfine Structure in the Microwave Spectrum of Water. I. Quadrupole Coupling in Deuterated Water. D. W. Posener. *Australian Journal of Physics*, v. 10, June 1957, p. 276-285.

15933 Vapor Pressures of the Rubidium Fluoride-Zirconium Fluoride and Lithium Fluoride-Zirconium Fluoride Systems. Karl A. Sense, Richard W. Stone, and Robert B. Filbert, Jr. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-1199, June 1957, 36 p. (UF767 U3.b Contin.)

Physical properties of the fused-salt systems.

15934 Effect of Changes in Hydration on Recoil Fragments in Neutron-Irradiated Permanganates. J. R. Bolton and K. J. McCallum. *Canadian Journal of Chemistry*, v. 35, Aug. 1957, p. 761-765.

15935 Hydride Transfer to Carbonium Ions. I. The Mechanism of the Reduction of Triphenylmethyl Carbonium Ion in Formic Acid. Ross Stewart. *Canadian Journal of Chemistry*, v. 35, Aug. 1957, p. 766-777.

In an attempt to prove that reduction can take place by hydride transfer, the conversion of triphenyl carbinol in formic acid to triphenylmethane via the carbonium ion was examined.

15936 The Structure of Aluminum Di- and Tri-Soaps. A. E. Leger, R. L. Haines, C. E. Hubley, J. C. Hyde, and H. Sheffer. *Canadian Journal of Chemistry*, v. 35, Aug. 1957, p. 799-816.

Infrared absorption was used to follow the course of the reactions of trimethylaluminum and aluminum isopropoxide with lauric acid.

15937 Equilibrium Constants for the Sulphur Isotope Exchange Between SO_2 and H_2SO_4. H. B. Dunford, A. G. Harrison, and H. G. Thode. *Canadian Journal of Chemistry*, v. 35, Aug. 1957, p. 817-820.

15938 The Reduction, Enolate Formation, and Solvolysis of Grignard Reagents in Optically Active Media. Norman Allentoff and George F. Wright. *Canadian Journal of Chemistry*, v. 35, Aug. 1957, p. 900-910.

15939 The Infrared and Raman Spectra of Toluene, Toluene-α-d_3, *m*-Xylene, and *m*-Xylene - αα′d_6. J. K. Wilmshurst and H. J. Bernstein. *Canadian Journal of Chemistry*, v. 35, Aug. 1957, p. 911-925.

Vibrational assignments were made for the four molecules consistent with vapor band contours, polarization data, the Teller Redlich ratio rule, and a modified ratio rule due to Fitzer and Scott.

15940 High Resolution Raman Spectroscopy of Gases. X. Rotational Spectrum of Butatriene ($H_2C{=}C{=}C{=}CH_2$). B. P. Stoicheff. *Canadian Journal of Physics*, v. 35, Aug. 1957, p. 837-841 + 1 plate.

An analysis of this spectrum yields the rotational constant $\frac{1}{8}(Bo + Co) = 0.13141 \pm 0.0001$ cm^{-1}. If the two outer C=C bonds in butatriene are assumed to have the same length as the C=C bonds in allene, namely 1.309 Å, it is found that the central C=C bond has a length of 1.284 ± 0.006 Å, a value which is shorter than that of the C=C bonds in ethylene and in allene.

15941 (French.) Electrochemical Behavior of Boron. pH Tension Equilibrium Diagram of the B-H_2O System at 25 C. **Comportement electrochimique du bore. Diagrammes d'équilibre tension-pH du système B-H_2O à 25°C.** E. Deltombe, N. de Zoubov, and M. Pourbaix. *Centre Belge d'Étude de la Corrosion, Rapport Technique*, no. 47, Mar. 1957, 19 p. (TA462 C33r Vis.)

Free standard enthalpies of the constituents of BH_2O at 25 C. Table of the possible reactions of these constituents. Electrochemical behavior of boron, borates, and boron hydrides.

15942 The Photoluminescence and Associated Processes of Complex Organic Molecules in the Vapor Phase. Brain Stevens. *Chemical Reviews*, v. 57, June 1957, p. 439-477.

The role of collisional transfer of energy in the general photokinetic scheme.

15943* (English.) **The Adsorption of Non-Polar Gases on Alkali Halide Crystals. IV. Calculations of the Adsorption Behavior of Non-Polar Gases on Cubic Potassium Chloride and Cubic Potassium Bromide. V. The Low-Temperature Adsorption of Non-Polar Gases on Cubic Potassium Bromide VI. The Low-Temperature Adsorption of Non-Polar Gases on Octahedral Potassium Chloride.** Teruo Hayakawa. *Chemical Society of Japan, Bulletin*, v. 30, June 1957, p. 332-349.

15944* (English.) **An Electron Diffraction Investigation of the Molecular Structure of 1,4-Dichlorobutyne. I. Determination of Bond Distances and Angles. II. A Study of Internal Rotation by Use of Halos in Small Angle Region.** Kôzo Kuchitsu. *Chemical Society of Japan, Bulletin*, v. 30, June 1957, p. 391-402.

15945* (English.) **Infrared Spectra of Organic Ammonium Compounds.** Koji Nakanishi, Toshio Goto, and Mamoru Ohashi. *Chemical Society of Japan, Bulletin*, v. 30, June 1957, p. 403-408.

15946 Catalytic Hydrogenation. I. The Hydrogenation of Unsaturated Amines Over Platinic Oxide. J. M. Devereux, K. R. Payne, and E. R. A. Peeling. *Chemical Society, Journal*, 1957, July, p. 2845-2851.

While weakly basic aromatic amines are non-toxic to platinic oxide, the more strongly basic hydrogenated amines and aromatic amines are toxic; the faster hydrogenation of amines in acid solutions is due to the formation there of non-toxic ammonium ions in place of toxic free bases.

15947 The Kinetics of the Rearrangement and Oxidation of Hydrazobenzene in Solution. I. The Rearrangement and Spontaneous Oxidation. II. The Catalysed Oxidation. D. A. Blackadder and Cyril Hinshelwood. *Chemical Society, Journal*, 1957, July, p. 2898-2906.

15948 Vibrational Frequency Correlations in Heterocyclic Molecules. III. Carbonyl Frequencies of Certain Compounds Possessing Fused Six-Membered Rings. D. G. O'Sullivan and P. W. Sadler. *Chemical Society, Journal*, 1957, July, p. 2916-2920.

15949 The Solvolysis of Arylmethyl Chlorides. II. A Molecular-Orbital Treatment and Further Experimental Evidence of the Transition From the Limiting to the Fully Nucleophil-Assisted Mechanism. III. Further Demonstration of Retardation of Solvolysis Rates of *peri*-Compounds. M. J. S. Dewar and R. J. Sampson. *Chemical Society, Journal*, 1957, July, p. 2946-2954.

15950 The Activation of Carbon-Carbon Double Bonds by Cationic Catalysts. V. The Dimerization of 1:1-Diphenylethylene in the System Benzene-Stannic Chloride-Water. Alwyn G. Evans and J. Lewis. *Chemical Society, Journal*, 1957, July, p. 2975-2981.

15951 The Kinetics and Mechanisms of Aromatic Halogen Substitution. V. Partial Rate Factors for the Acid-Catalysed Bromination of Diphenyl by Hypobromous Acid. P. B. D. de la Mare and M. Hassan. *Chemical Society, Journal*, 1957, July, p. 3004-3011.

15952 The Heat of Dilution of Aqueous Uranyl Acetate Solutions. B. C. L. Salman and A. G. White. *Chemical Society, Journal*, 1957, July, p. 3197-3202.

Measurements at 25 C are discussed in terms of the complex-ion formation and hydrolysis processes.

15953* (German.) Separation and Use of Stable Isotopes. **Trennung und Anwendung stabiler Isotope. I.** Production of Stable Isotopes as a Distillation Problem. **Gewinnung stabiler Isotope als Destillationsproblem.** Erich Krell. *Chemische Technik*, v. 9, June 1957, p. 333-340.

Separation methods. Production of H, O, C, and Cl isotopes. List of uses.

15954* (French.) Structural Defects in Neutron-Irradiated Lithium Fluoride. Groupings of Interstitial Atoms. **Imperfections de structure du fluorure de lithium irradié aux neutrons: rassemblements d'atomes interstitiels.** Marianne Lambert and André Guinier. *Comptes Rendus*, v. 245, July 29, 1957, p. 526-529.

X-ray diffusion along axes $<100>$ showed the existence of a planar disorder that was studied in connection with the radiation and the thermal correction performed.

15955* (Russian.) Relation Between the Viscosity and Molecular Structure of Liquids. **O sviazi koeffitsienta viazkosti so strukturoi veshchestva v zhidkom sostoianii.** A. Z. Golik and D. N. Karlikov. *Doklady Akademii Nauk SSSR*, v. 114, May 11, 1957, p. 361-364.

Similarity of curves relating viscosity with intensity of dispersed X-rays and with the atomic distribution of solutions of Zn and Cd in Hg indicate that liquids possessing the same coefficient of viscosity also possess the same structure.

15956* (Russian.) The Absorption of Light by CdS Crystals. **Pogloshchenie sveta kristallami CdS.** V. L. Broude, V. V. Eremenko, and E. I. Rashba. *Doklady Akademii Nauk SSSR*, v. 114, May 21, 1957, p. 520-523.

Spectra of monocrystals of CdS hexagonal modification were at 20.4 K in polarized light with the aid of a microprojector.

15957* (German.) Change of the Index of Refraction and of Density of Hydrocarbons During Hydration and Isomerization. **Änderung des Brechungsindex und der Dichte von Kohlenwasserstoffen beim Hydrieren und Isomerisieren.** Jan Andries Meys, Hein Israel Waterman, and Dirk Willem van Krevelen. *Erdöl und Kohle*, v. 10, July 1957, p. 428-429.

During the saturation of olefins and aromatics and the isomerization of hydrocarbons, the change of the index of refraction, divided by the change of density, is about 0.85 to 1.00 for the saturation and about 0.45 for isomerization. Application to the hydration of aromatic substances.

15958 The Near Ultra-Violet Absorption Spectrum of 2:5-Dimethyl Furan. V. Santhamma. *Faraday Society, Transactions*, v. 53, Aug. 1957, p. 1061-1064 + 1 plate.

15959 The Second Virial Coefficients of Pyridine and Benzene, and Certain of Their Methyl Homologues. R. J. L. Andon, J. D. Cox, E. F. G. Herington, and J. F. Martin. *Faraday Society, Transactions*, v. 53, Aug. 1957, p. 1074-1082.

The coefficients of pyridine, α-picoline, β-picoline, γ-picoline, 2:6-lutidine, benzene, toluene, *o*-xylene, *m*-xylene, and *p*-xylene were obtained by means of vapor compressibility measurements at temperatures near the normal boiling points.

15960 The Mechanism of the Ionization of Alkali Metals in Hydrogen Flames. F. M. Page and T. M. Sugden. *Faraday Society, Transactions*, v. 53, Aug. 1957, p. 1092-1101.

The steady-state ionization of Na and Li was examined as a function of height above the burner in pre-mixed hydrogen + air flame gases at atmospheric pressure.

15961 Chemisorption of Ethane at Iron and Nickel Oxide. W. J. Thomas. *Faraday Society, Transactions*, v. 53, Aug. 1957, p. 1124-1131.

Sorption of C_2H_6 at supported and unsupported iron and nickel oxide shows that saturated hydrocarbons may be chemisorbed by both catalysts under different temperature conditions. Temperatures in the range 200 to 400 C are necessary for a slow but strong chemisorption at F_2O_3, while a rapid weak chemisorption occurs at NiO in the range −25 to zero C.

15962 The Equilibrium Between Ethyl Methacrylate and Its Polymer. R. E. Cook and K. J. Ivin. *Faraday Society, Transactions*, v. 53, Aug. 1957, p. 1132-1135.

15963* (Italian.) Magnetic Behavior and Absorption Spectrum of Chromium Actate. **Comportamento magnetico e spettro d'assorbimento dell'acetato cromoso.** Claudio Furlani. *Gazzetta Chimica Italiana*, v. 87, July-Aug. 1957, p. 876-884.

The properties of chromium acetate are explained by the electrostatic theory of complexes on the basis of the X-ray measurements of Niekerk and Schoening and of the direct interaction of couples of adjacent Cr^{3+} ions.

15964* Investigations in Non-Aqueous Solvents. II. Solubility and Conductances of Some Rare Earth Metal and Thorium Acetates in Ethylenediamine. T. Muniyappan and B. Anjaneyalu. *Indian Academy of Sciences, Proceedings*, v. 45, sec. A, June 1957, p. 412-417.

15965* (English.) **The Dimorphism and the Crystal Habits of Copper-Oxinate Precipitates.** Eiji Suito and Eiichi Sekido. *Japan Academy, Proceedings*, v. 33, Apr. 1957, p. 198-200.

The conditions forming two kinds of copper-oxinates and the transformation from needle to plate form were investigated from the viewpoint of chelate chemistry and crystallography.

15966* Kinetics of Papain Action. I. Hydrolysis of Benzoyl-*L*-Argininamide. Anne Stockell and Emil L. Smith. *Journal of Biological Chemistry*, v. 227, July 1957, p. 1-26.

The kinetic parameters K_m and k_s have been determined under a wide variety of conditions for the papain-catalyzed hydrolysis of α-benzoyl-*L*-argininamide. Carbobenzoxy-*L*-glutamic acid and carbobenzoxy-L-aspartic acid are inhibitors of papain when the ω-carboxyl group is unionized. A possible mechanism for papain-catalyzed hydrolysis is postulated.

15967 Thermal Forces on Aerosol Particles in a Thermal Precipitator. C. F. Schadt and R. D. Cadle. *Journal of Colloid Science*, v. 12, Aug. 1957, p. 356-362.

The thermal forces on NaCl and Fe particles were 20 to 40 times the values predicted by theory, although there was a decrease in thermal force with increasing thermal conductivity.

15968 Collisional Energy Exchange in Gases. Use of the Spectrophone for Studying Relaxation Processes in Carbon Dioxide. Marilyn E. Jacox and S. H. Bauer. *Journal of Physical Chemistry*, v. 61, July 1957, p. 833-844.

15969 Studies in Non-Equilibrium Rate Processes. II. The Relaxation of Vibrational Non-Equilibrium Distributions in Chemical Reactions and Shock Waves. Kurt E. Shuler. *Journal of Physical Chemistry*, v. 61, July 1957, p. 849-856.

15970 Effect of Energy Migration on Fluorescence in Dye Solutions. J. Lavorel. *Journal of Physical Chemistry*, v. 61, July 1957, p. 864-869.

The steady-state spatial distribution of excited molecules in an illuminated liquid medium exhibiting fluorescence was calculated assuming the occurrence of energy migration by resonance transfers. A tentative value of the mean displacement between absorption and emission due to resonance transfers is 20 mμ in an 0.05 M solution.

15971 Surface Properties of Magnesium Oxide. R. I. Razouk and R. Sh. Mikhail. *Journal of Physical Chemistry*, v. 61, July 1957, p. 886-891.

A study of the adsorption of *n*-hexane and cyclohexane on the products obtained by dehydration of brucite in the presence of air and under vacuum.

15972 Hydrogen and Bond Systems—Temperature Dependence of OH Frequency Shifts and OH Band Intensities. Jack N. Finch and Ellis R. Lippincott. *Journal of Physical Chemistry*, v. 61, July 1957, p. 894-902.

Temperature dependence was studied in the range of 30 to −80 C for methyl, ethyl, isopropyl, *n*-butyl, isoamyl and *n*-hexyl alcohols, phenol, *o*-chlorophenol, and 2-methyl-4-methoxy-2-pentanol.

15973 A Theory for the Estimation of Surface and Interfacial Energies. I. Derivation and Application to Interfacial Tension. L. A. Girifalco and R. J. Good. *Journal of Physical Chemistry*, v. 61, July 1957, p. 904-909.

15974 Kinetics of Some Hydrogenations Catalyzed by Raney Nickel. Thomas Freund and Hugh M. Hulburt. *Journal of Physical Chemistry*, v. 61, July 1957, p. 909-912.

The Raney Ni catalyzed rates of reduction of acetone to 2-propanol, acetophenone to 1-phenylethanol, and styrene to ethylbenzene were measured as a function of H pressure from 20 to 150 cm. and temperature from 25 to 46 C.

15975 Studies of the Fischer-Tropsch Synthesis. XVII. Changes of Iron Catalysts During Pretreatment and Synthesis. Karl C. Stein, Gordon P. Thompson, and Robert B. Anderson. *Journal of Physical Chemistry*, v. 61, July 1957, p. 928-932.

Data show how the pore geometry of reduced fused iron catalysts is affected by formation of interstitial phases and by oxidation.

15976 Linear Crystallization Velocities of Sodium Acetate in Supersaturated Solutions. Paul L. Dietz, Jr., John S. Brukner, and C. A. Hollingsworth. *Journal of Physical Chemistry*, v. 61, July 1957, p. 944-948.

15977 An Analysis of the Dynamical Equations of Three Component Diffusion for the Determination of Friction Coefficients. I. Ole Lamm. *Journal of Physical Chemistry*, v. 61, July 1957, p. 948-952.

15978 Functional Group Effects in the Adsorption of Organic Compounds From Aqueous Solution by Mercury. Robert S. Hansen, Robert E. Minturn, and Donald A. Hickson. *Journal of Physical Chemistry*, v. 61, July 1957, p. 953-957.

Isotherms for the adsorption of pentanol-1, pentanone-3, pentanenitrile, 2,4-pentanedione, phenol, and octanoic acid from aqueous perchloric acid solution by Hg are inferred from differential double layer capacitance measurements in these systems. Standard free energies of adsorption are calculated. Functional groups appear to influence adsorption only to the extent that they influence molecular polarizability and character of adsorbate-solvent interactions.

15979 A Mass Spectrometric Method for the Determination of Dissociation Energies of Diatomic Molecules. J. Drowart and R. E. Honig. *Journal of Physical Chemistry*, v. 61, July 1957, p. 980-985.

15980 A Study of Interacting Flows in Diffusion of the System Raffinose-KCl-H_2O At 25°. Peter J. Dunlop. *Journal of Physical Chemistry*, v. 61, July 1957, p. 994-1000.

15981 Studies on Coordination Compounds. XV. Formation Constants for Chloride and Acetylacetonate Complexes of Palladium(II). Henry A. Droll, B. P. Block, and W. Conard Fernelius. *Journal of Physical Chemistry*, v. 61, July 1957, p. 1000-1004.

The stepwise formation constants for the chloride complexes were determined from spectrophotometric measurements made at 21, 29.5, and 38 C. Reaction between the chloride and acetylacetone in aqueous solution was investigated from pH measurements at 20, 30, and 40 C.

15982 The Adsorption of *n*-Nonadecanoic Acid on Mechanically Activated Metal Surfaces. Hilton A. Smith and Robert M. McGill. *Journal of Physical Chemistry*, v. 61, Aug. 1957, p. 1025-1036.

When fresh surfaces of metals more electropositive than Ag are prepared by machining the metal under a dilute cyclohenane solution of n-nonadecanoic acid, the acid is adsorbed rapidly on the fresh surface to the extent of just one monomolecular layer. Silver and the less electropositive metals do not form a full monolayer. The general kinetics of this decay are in accord with those of the decay process of the Kramer effect, which is responsible for other mechanical activation phenomena.

15983 The Solubility of Helium, Neon, Argon and Krypton in Some Hydrocarbon Solvents. H. Lawrence Clever, Rubin Battino, J. H. Saylor, and P. M. Gross. *Journal of Physical Chemistry*, v. 61, Aug. 1957, p. 1078-1082.

The solubility of He, Ne, Ar, and Kr was determined in 13 hydrocarbon solvents at three temperatures and a total pressure of one atmosphere. Heats and entropies of solution were calculated from the linear dependence of the logarithm of the solubility with the inverse absolute temperature over the 30° temperature range and the results compared with entropies calculated from simple qualitative pictures of gas solubility.

15984 The Kinetics of the Dihalide Ions From the Flash Photolysis of Aqueous Alkali Halide Solutions. L. I. Grossweiner and M. S. Matheson. *Journal of Physical Chemistry*, v. 61, Aug. 1957, p. 1089-1095.

Flash photolysis of aqueous solutions of iodide, bromide, or chloride ions produces unstable species believed to be the dihalide ions. The maximum of the longest wave length and most prominent band is at 370 mμ. for iodide ion, 350 mμ. for bromide ion and near 340 mμ. for chloride ion. Flash irradiation of triiodide ion in the 353 mμ. absorption band produces a transient species whose spectrum and decay kinetics closely resemble those obtained from iodide ion. Assuming the common identity of the transient species, the maximum extinction coefficient of diiodide ion is estimated as 15,6000 ± 3000 M^{-1} cm.$^{-1}$.

15985 Phase Equilibria of the System Chlorine Trifluoride-Hydrogen Fluoride. R. M. McGill, W. S. Wendolkowski, and E. J. Barber. *Journal of Physical Chemistry*, v. 61, Aug. 1957, p. 1101-1105.

The solid-liquid phase diagram is simple with a single eutectic occurring at −88.8° and 7.5 formula % ClF_3. Liquid-vapor equilibria were determined at total pressures of 1.5, 2.0, 2.5, 3.0, and 4.0 atm. by means of a Ni Othmer-type equilibrium still.

15986 The Low-Temperature Thermodynamic Properties of Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene, 1,2,3,4-Tetrahydronaphthalene, *trans*-Decahydronaphthalene and *cis*-Decahydronaphthalene. J. P. McCullough, et al. *Journal of Physical Chemistry*, v. 61, Aug. 1957, p. 1105-1116.

From the low-temperature thermal data for each compound, values of the thermodynamic functions in the solid and liquid states were computed at selected temperatures from 10 to 370 K.

15987* (French.) High Temperature X-Ray Diffraction Study of Molten Salts. **Étude des sels fondus par diffraction des rayons X aux températures élevées. I.** Structure of Fluorides LiF, NaF, and KF in Liquid State. **Structure a l'état liquide des fluorures LiF, NaF et KF.** Jerzy Zarzycki. *Journal de Physique et le Radium (Suppl.)*, v. 18, July 1957, p. 65A-69A.

15988* Viscosity of Dilute Solutions of Preparations of Deoxyribonucleic Acid at Low and Medium Rates of Shear. H. Eisenberg. *Journal of Polymer Science*, v. 25, Aug. 1957, p. 257-271.

The measurements are not amenable to interpretation by the rigid ellipsoid of rotation model but are better described by the Gaussian chain model with high internal viscosity.

15989* High Pressure Vapour-Liquid Equilibria of Non-Ideal Solutions. III. Benzene-*n*-Propanol System. V. N. Kumarkrishna Rao, D. R. Swami, and M. Narasinga Rao. *Journal of Scientific & Industrial Research*, v. 16, sec. B, June 1957, p. 233-240.

Pressures up to 21 atm. obtained for the system; data correlated by Redlich-Kister equation containing three constants.

15990* (Russian.) Study of Mechanism of the Reduction Reaction of CO_2 by Means of Radioactive Carbon. **Izuchenie mekhanizma reaktsii vosstanovleniia dvuokisi ugleroda pri pomoshchi radioaktivnogo ugleroda.** I. G. Petrenko. *Khimiia i Tekhnologiia Topliva, i Masel*, 1957, no. 7, July, p. 15-20.

Theoretical and experimental description of isotopic method for investigation of interaction process between C and CO_2. It permits a closer look at the mechanism of the heterogeneous deoxidation reaction of CO_2 by coal.

15991 Simple Molecular Models of Fused Salt Melts. L. Monchick. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission)*, KAPL-1776, Apr. 1957, 17 p. (UF767 Un3.1ka Contin.)

Develops several simple statistical mechanical models and determines whether they are capable of interpreting the available experimental data. Models were formulated that agreed with the observed thermodynamic behavior, but no model seemed to be favored to the exclusion of the others.

15992 Pile-Induced Threshold Reactions in Stainless Steel. R. P. Schuman and A. C. Mewherter. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission)*, KAPL-1779, May 1957, 14 p. (UF767 Un3.1ka Contin.)

Radiochemical separations were made, and the yields of long-lived activities produced by (n,p), (n,2n), and (n,α) reactions were determined.

15993* (Russian.) The Atomic Crystal Structure of Complex Acid-Amine Nickel Compounds. **Atomnaia struktura kristallov kompleksnykh soedinenii nikelia atsidoaminovogo tipa.** M. A. Porai-Koshits, E. K. Iukhno, A. S. Antsishkina, and L. M. Dikareva. *Kristallografiia*, v. 2, no. 3, 1957, p. 371-381.

An X-ray structure investigation of six complex Ni compounds was carried out: $Ni(C_2H_5N)_4X_2$, where X=Br, NCS; $Ni(NH_3)_4X_2$, where $X=NO_2$, NCS; $NH_4Ni(NH_3)_2(NCS)_3$; $(NH_4)_2Ni(NH_3)_2(NCS)_4$. Interatomic nickel-addendum distances and the character of the chemical bonds in thiocyanate groups are established.

15994* (Russian.) Crystal Chemistry of Complex Divalent Platinum Compounds. Effect of Transdirecting in Crystalline Substances. **Kristallokhimiia kompleksnykh soedinenii dvukhvalentnoi platiny. Effekt transvliianiia v kristallicheskikh veshchestvakh.** G. B. Bokii and G. A. Kukina. *Kristallografiia*, v. 2, no. 3, 1957, p. 400-407.

An X-ray structure investigation of compounds K_2PtBr_4, $K[PtNH_3Cl_3]$, $K[PtNH_3Br_3]$, $K[PtNH_3Cl_3].H_2O$, $K[PtNH_3Br_3].H_2O$, $K[PtC_2H_4Cl_3].H_2O$, and $K[PtC_2H_4Br_3].H_2O$ was carried out.

15995* Equilibrium Constant of Reaction $Al_2O_3(s)=2Al+30$ in Liquid Iron. Hiroshi Sawamura, Toshisada Mori, and Taiji Araki. *Kyoto University, Memoirs of the Faculty of Engineering*, v. 19, Apr. 1957, p. 207-219.

15996* (Hungarian.) The Examination of Copper Catalysts Attached to a Carrier. **Hordozóra felvitt rézkatalizátorok vizsgálata. I.** Correlation Between Particle Size of the Carrier and Reaction Rate in the Case of Hydrogenation in the Gas Phase. **Összefüggés a katalizátorhordozó szemesenagysága és a katalizált reakció sebessége között gőzfázisú hidrogénezési reakciónál. II.** Correlation Between Quantity of Catalyst and Rate of Reaction in the Case of Heterogeneous Hydrogenation in the Gas Phase. **Összefüggés a katalizátormennyiség és a katalizált reakció sebessége között heterogén katalitikus gőzfázisú hidrogénezésnél.** Karoly Schügerl, Imre Pászthory, and Miklós Bakos. *Magyar Kémiai Folyóirat*, v. 63, Feb.-Mar. 1957, p. 52-60.

15997 Basic Chemistry of High Temperature Inorganic Systems, Semiannual Progress Report, July-Dec. 1956. S. J. Yosim and T. A. Milne. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-1925, July 1957, 49 p. (UF767 Un3.1na Contin.)

Experiments to determine the heat of formation of ThF_4 by studying the reaction of ThF_4 with SiO_2 are described. A kinetic study of the thermal decomposition of $Th(NO_3)_4$ has been initiated.

15998* (Italian.) Molecular Spectroscopy of Oxygen by Means of Microwaves. Shape of the Absorption Lines. **Spettroscopia molecolare dell'ossigeno per mezzo di microonde. Forma delle righe di assorbimento.** N. Carrara. *Nuovo Cimento (Supplemento)*, v. 4, ser. 10, no. 4, 1956, p. 1593-1608.

15999 Extraction of Chromium With Trioctylphosphine Oxide. J. C. White and W. J. Ross. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2326, July 1957, 37 p. (UF767 U3o Contin.)

An excellent reagent for the separation by solvent extraction of the two common oxidation states of Cr.

16000* (English.) **The Infrared Absorption of Rosin Acids and Their Derivatives. III. Binary Mixtures of Abietic, Pimaric, and Podocarpic Acids.** Henrik H. Bruun. *Paperi ja Puu*, v. 39, no. 7, 1957, p. 341-343.

16001 Effect of Pressure on Thermal Conductivity of Liquids. J. M. Lenoir. *Petroleum Refiner*, v. 36, Aug. 1957, p. 162-164.

Presents a generalized empirical method to account for the effect of pressure; method correlates the available data with an average deviation of less than 2%.

16002 Density Change of Sodium Chloride Produced by Proton Irradiation and Its Thermal Annealing. Koichi Kobayashi. *Physical Review*, v. 107, ser. 2, July 1, 1957, p. 41-43.

The change upon irradiation with 350 m.e.v. protons with a total flux of 1×10^{16} protons/cm.^{2} is -8.3×10^{-4}g/cm.^{3}.

16003* (English.) **Fine Structures of X-Ray Absorption Spectra of Crystalline and Amorphous Germanium.** Toshio Shiraiwa, Tsutomu Ishimura, and Masao Sawada. *Physical Society of Japan, Journal*, v. 12, July 1957, p. 788-792.

16004* (English.) **Fine Structures of X-Ray *K* Absorption Spectra of Copper in Various Copper Compounds.** Kenjiro Tsutsumi, Akira Hayase, and Masao Sawada. *Physical Society of Japan, Journal*, v. 12, July 1957, p. 793-801.

16005 (French.) A Study of the Liquid-Vapor Equilibria Between Acetone, Isopropanol and Water at 760 mm Mercury Pressure. **Étude des équilibres liquid-vapeur entre l'acétone, l'isopropanol et l'eau sous la pression de 760 mm de mercure. III.** Compatibility of Results With Thermodynamic Laws. **Compatibilité des résultats avec les lois de la thermodynamique.** B. Choffé and L. Asselineau. *Revue de l'Institut Francais du Pétrole et Annales des Combustibles Liquides*, v. 12, May 1957, p. 565-575.

16006 The Compressibilities, Free Volumes and Equation of State for Molten Electrolytes: Some Alkali Halides and Nitrates. J. O'M. Bockris and N. E. Richards. *Royal Society, Proceedings*, v. 241, ser. A, July 23, 1957, p. 44-66.

Velocities of sound through molten salts were measured up to a maximum temperature of 1000 C for LiCl, NaCl, KCl, CsCl, $CdCl_2$, LiBr, KBr, CsBr, NaI, KI, $LiNO_3$, $NaNO_3$, and KNO_3.

16007 The Influence of Dielectric Saturation on the Thermodynamic Properties of Aqueous Ions. K. J. Laidler and C. Pegis. *Royal Society, Proceedings*, v. 241, ser. A, July 23, 1957, p. 80-92.

16008 Thermochemistry and Reactivity of the Azides. III. Thermal Decomposition of Silver Azide and Its Sensitization by Artificial Lattice Defects. P. Gray and T. C. Waddington. *Royal Society, Proceedings*, v. 241, ser. A, July 23, 1957, p. 110-121.

Decomposition is sensitized by the incorporation of cyanamide ion into the crystal lattice. The sensitized azide explodes at a much lower temperature than the unsensitized azide. At temperatures too low for explosion it decomposes at a much greater rate, though the kinetics are unchanged and no significant change is found in the energy of activation.

16009 Explicit Equations for the Calculation, by Successive Approximations, of Equilibrium Gas Compositions at High Temperatures: The Hydrogen + Carbon + Oxygen and the Hydrogen + Carbon + Oxygen + Nitrogen Systems Without Solid Carbon Formation. F. J. Weinberg. *Royal Society, Proceedings*, v. 241, ser. A, July 23, 1957, p. 132-140.

16010 An Analysis of the Absorption Spectrum of Praseodymium Chloride. B. R. Judd. *Royal Society, Proceedings*, v. 241, ser. A, Aug. 20, 1957, p. 414-422.

The terms and levels of the configuration f^2, corresponding to Pr^{3+}, are examined.

16011* (German.) Thermal Diffusion of Macromolecules in Solution. **Thermodiffusion von Makromolekülen in Lösung.** Hans-Günther Langhammer. *Svensk Kemisk Tidskrift*, v. 69, nos. 6-7, 1957, p. 328-342.

Separation of homologous polymer compounds. Theoretical study of a liquid-separator tube. Results of tests on separation rate and the Soret coefficient. Fractionation by thermodiffusion.

16012* (Russian.) On the Complexes of Certain Metals With Polyphosphate. **O kompleksakh nekotorykh metallov s polifosfatom.** A. V. Pamfilov, A. I. Lopushanskaia, and E. B. Gusel'. *Ukrainskii Khimicheskii Zhurnal*, v. 23, no. 3, 1957, p. 297-302.

Polarographic data permits a coordinate and constant of instability to be calculated for polyphosphate complexes of Pb and Cd.

16013* (Polish.) Mechanism of Fries' Rearrangement. **Mechanizm przegrupowania Friesa.** Lidia Prajer. *Wiadomosci Chemiczne*, v. 11, Mar. 1957, p. 177-205.

Aryl esters were decomposed by suitable catalysts, with formation of an acyl cryptocation $(RCO)^+$ or a sulfonated cryptocation $(RSO)^+$. Formation of different isomer hydroxyaryl ketones or hydroxyaryl sulfones.

16014* (German.) The Determination of the Formation Enthalpy of Titanium Tetrabromide. **Bestimmung der Bildungsenthalpie von Titantetrabromid.** H. L. Schläfer and H. H. Schmidtke. *Zeitschrift für Physikalische Chemie (Frankfurt)*, v. 11, June 1957, p. 297-307.

Simple process not mentioned in literature for production of $TiBr_4$. Normal formation enthalpy of solid $TiBr_4$ was determined by calorimetry of the reaction $Ti + 2Br_2 \rightarrow TiBr_4$, to be $H°_{298} = -147.9 \pm 0.3$ kcal. per mol.

16015* (Russian.) The Effect of the Porosity of Graphite Adsorbents on the Adsorption and Heat of Adsorption of Hexane Vapors. **Vliianie poristosti grafitovykh adsorbentov na adsorbtsiiu i teplotu adsorbtsii parov geksana.** N. N. Avlul', G. I. Berezin, A. V. Kiselev, I. A. Lygina, and G. G. Muttik. *Zhurnal Fizicheskoi Khimii*, v. 31, May 1957, p. 1111-1125.

In a constant heat exchange adsorption calorimeter the isotherms and heats of adsorption of hexane vapor were determined on loose and compressed thermal carbon black (large pore "charcoal") and on finely porous activated charcoal.

16016* (Russian.) Electronographic Investigation of Molybdenum Germanium Hetero-Polyacids. **Elektronograficheskoe issledovanie molibdenovykh geteropolikislot germaniia.** Z. F. Shakhova, G. N. Tishchenko, and R. K. Motorkina. *Zhurnal Obshchei Khimii*, v. 27, May 1957, p. 1118-1124 + 1 plate.

In the formation of Ge-V-Mo heteropolyacid, vanadium substitutes for Mo as the heteropolyanion.

16017* (Russian.) Investigation in the Field of Conjugated Systems. **Issledovaniia v oblasti sopriazhennykh sistem. LXXIV.** Infrared Spectra and the Reaction Potential of Vinylacetylene Hydrocarbons. **Infrakrasnye spektry i reaktsionnaia sposobnost' vinilatsetilenovykh uglevodorodov.** A. A. Petrov, Iu. I. Porfir'eva, and G. I. Semenov. *Zhurnal Obshchei Khimii*, v. 27, May 1957, p. 1167-1174.

Infrared spectra of 11 compounds are reported.

See also: **15796** (light sources in spectrochemical analysis); **16228** (mass transfer through turbulent boundary layer); **16283** (determination of combustion temperatures); **16821** (radiative decomposition of $Th(NO_3)_4$).

COATINGS

16018 Improved Rosin-Containing Coatings Vehicles Through the Use of Epoxy Resins. Randolph E. Dunbar and Mark F. Dante. *American Paint Journal*, v. 41, Aug. 26, 1957, p. 96 + 8 pages.

Procedures for the preparation of rosin modified epoxy resin esters, epoxy resin tall oil phthalic alkyds, and various types of epoxy resin *in situ* varnishes.

16019 Controlled Moisture Condensation Apparatus for Evaluation of Rust-Preventive Oils. H. Roden. *ASTM Bulletin*, no. 223, July 1957, p. TP121-TP127.

Comparative tests with a closed-cell, high humidity, moisture condensation apparatus which provides specific temperature differences between humid ambient air and steel surface, showed it to be a faster, more reproducible method.

16020 Conductive and Resistive Coatings. R. J. Phair. *Bell Laboratories Record*, v. 35, Sept. 1957, p. 331-335.

Resins or lacquers pigmented with metals or carbon can be applied like paint to give thin resistive films in complex patterns and may also be used to cover irregular surfaces.

16021 Reactions Involved in the Impregnation of Steel Surfaces With Metals. V. A. Illarionov. *Henry Brutcher Translation No.* 3967, 16 p. (From *Metallovedenie i Obrabotka Metallov*, no. 3, Mar. 1957, p. 2-8.) Henry Brutcher, Altadena, Calif.

A unified explanation of and theory for aluminizing, siliconizing, chromizing, and carburizing.

16022 Testing of Coal Tar Coatings. III. Resistance to Fouling and Degradation by Marine Organisms. R. B. Teel and W. F. Fair, Jr. *Corrosion*, v. 13, Aug. 1957, p. 491t-500t.

Barrier type, aggregate reinforced hot enamel mastic coatings can provide adequate resistance to barnacle penetration over extended time periods. Prolonged antifouling protection can be furnished by coal tar coatings modified to be less impermeable to water and thus provide the required leachability of toxics necessary for continued good performance. Workable compositions are given.

16023* Vitreous Enamelling on Steel and Cast Iron. J. W. G. Pedder. *Corrosion Prevention and Control*, v. 4, Aug. 1957, p. 37-40.

Review of compositions, surface preparation, and application techniques. Properties and uses of coatings.

16024 Spray Painting With Compressed Air Atomization. A. A. B. Harvey. *Electroplating and Metal Finishing*, v. 10, Aug. 1957, p. 243-248.

Various types of spray guns and their operation. (To be concluded.)

16025* (German.) Measurement of Adherence of Paint Films. **Die Messung der Haftfestigkeit von Anstrichfilmen.** G. Fuchslocher and K. Hamann. *Fette, Seifen, Anstrichmittel*, v. 59, July 1957, p. 517-521.

With an impulse method, the velocity is measured at which the force of inertia is equal to the force of adherence. Equipment is described.

16026* Swelling of Paint Films in Water. XI. Mixed-Pigment Paints in Linseed Oil. F. L. Browne. *Forest Products Journal*, v. 7, July 1957, p. 248-252.

Study made of the relation between swelling and composition for all possible combinations of basic carbonate white lead (low swelling), zinc oxide (high swelling), and rutile titanium dioxide extended with magnesium silicate.

16027 Paint Circulating Systems. Frank L. Whitten. *Industrial Finishing*, v. 33, Aug. 1957, p. 48 + 7 pages.

A modern paint circulating system permits lower operating cost and the delivery of more material faster.

16028* Non-Flammability, Cost Savings, Top Bonding and Penetration Claimed for Water Reducible Varnish. *Insulation*, v. 3, Aug. 1957, p. 14-16.

Application and physical properties of new electrical insulating varnish; composition is not revealed.

16029 Conversion Coatings for Metals. Robert J. Fabian. *Materials in Design Engineering*, v. 46, Aug. 1957, p. 121-136.

Inorganic coatings applied by chemical and electrochemical means, improve paint bonding, provide corrosion resistance, decorate the surface, aid in cold forming, and increase wear resistance.

16030 Thick Oxide Films on Aluminium Alloys. J. M. Kape. *Metal Industry*, v. 91, Aug. 23, 1957, p. 148-150.

Hard anodizing by d.c. (To be continued.)

16031* (German.) "Ruptures" in Hot Galvanizing. **Zum "Abreissen" der Feuerverzinkung.** H. Bablik, F. Götzl, and E. Nell. *Metall*, v. 11, Aug. 1957, p. 649-651.

Analysis of, and methods for preventing, formation of Fe-Zn phases in place of pure Zn layers in hot galvanizing.

16032* Dielectric Heat Cooks Metal Sandwiches. Don W. Cole. *Metalworking Production*, v. 101, Aug. 9, 1957, p. 1377-1381.

Glass-fiber laminates and metal-to-metal bonded assemblies can be cured by dielectric heat. The method out-performs oven curing.

16033* (French.) Five-Year Review of Sulfurizing. **Cinq ans d'observations sur la "sulfinuzation".** Y. de Villemeur. *Métaux, Corrosion-Industries*, v. 32, June 1957, p. 249-259.

Friction properties were greatly improved by sulfurizing. Preliminary machining was unnecessary. Certain structures were observed explaining the improved qualities acquired by the metallic surfaces treated.

16034* Anti-Corrosive Pigments. N. J. Read. *Official Digest. Federation of Paint and Varnish Production Clubs*, v. 29, Aug. 1957, p. 751-779.

Compilation of four papers on calcium plumbate, metallic lead, zinc yellow, and zinc dust pigments, presented in Birmingham, England, Feb. 23, 1956.

16035* The Effect of Light of Different Wavelengths on the Degradation of Clear Coatings. Nissim J. Marshall. *Official Digest. Federation of Paint and Varnish Production Clubs*, v. 29, Aug. 1957, p. 792-820.

Short wavelengths increase toughness, while long wavelengths increase brittleness. As the quantity of radiation increased, tensile strength became greater and elongation decreased, accompanied by chemical photo-oxidation reactions combining volatilization with molecular scission.

16036 A Comparison of Vinyl Acetate Homopolymers and Copolymers in Emulsion Paints. A. C. Fletcher and P. J. Wilson. *Oil & Colour Chemists' Association, Journal*, v. 40, Aug. 1957, p. 693-703.

Copolymers embrittle less readily than homopolymers plasticized with dibutyl phthalate but are not superior to homopolymers plasticized with di(butoxyethyl) phthalate or polyester. Color variations on storage are dependent on the composition of the water phase. Copolymer emulsions have better pigment-binding properties than d.b.p.- and polyester-plasticized homopolymer emulsions of the same water phase.

16037 Production Rate in Three-Roll Mills. J. H. Taylor, Jr. and A. C. Zettlemoyer. *Paint Manufacture*, v. 27, Aug. 1957, p. 299 + 6 pages.

The relationship between pigment particle size and production rate is described and formulas are given which, together with operating data, can be used to assess the operating efficiency of a given mill. The information can provide a basis for the estimation of production rates and product quality.

16038 Epoxy Resins in Surface Coatings. L. M. Barakan. *Paint Manufacture*, v. 27, Aug. 1957, p. 308-313.

The physical and chemical properties of surface coatings based on epoxy resins are described and formulations are suggested for special finishes. Details are given of the types of catalysts which may be used, the production of oxidizing and plasticizing esters, methods of reacting with amino and phenolic resins, and the manufacture of paint based on catalyzed epoxy resins.

16039 Catalytic Processes Relating to the Surface-Coating Industries. *Paint Technology*, v. 21, July 1957, p. 233-236.

Papers on reaction rates and varnish technology, cationic polymerization of the vinyl ethers, and ionizing radiations in polymer chemistry.

16040* High-Low Solvent Systems for Wood Lacquers. R. F. Buller. *Paint and Varnish Production*, v. 47, Aug. 1957, p. 25-30.

Solvent blends containing a total of around 65% by volume of fast-evaporating solvents and 35% by volume slow-evaporating solvents appear to be good starting formulations for application to wood lacquer systems.

16041 Phenolic Resins in Protective Coatings. David M. Fix. *Paint and Varnish Production*, v. 47, Aug. 1957, p. 42 + 6 pages.

A survey of the utilization of this type of coating in a wide range of applications.

16042* Electrostatic Spraying Systems. F. D. Johnson. *Product Finishing*, v. 10, Aug. 1957, p. 56-61.

Articles being coated are mounted on a grounded conveyor; electrostatic grid is mounted so that the upright charged wires are from 12 to 18 in. away from the work.

16043* Phosphating Processes and Their Applications in Metal Finishing. III. Theoretical Aspects. D. J. Fishlock. *Product Finishing*, v. 10, Aug. 1957, p. 82-91.

Reactions involved; pre-treatment effects; solution composition; coatings produced.

16044 Low-Pressure Hot Spray Painting. Warren Beach. *Products Finishing*, v. 21, Aug. 1957, p. 42-43.

Describes process and its applications.

16045 Redesigned Silvering Line Boosts Mirror Production. L. J. Esser. *Products Finishing*, v. 21, Aug. 1957, p. 56-58.

Step by step silvering of mirrors is described.

16046* (French.) Protection by Means of Anodic Layers on Aluminum and Its Alloys. Methods Used in Testing These Layers. **Protection par les couches anodiques sur l'aluminium et ses alliages. Méthodes d'essai de ces couches.** W. Wiederholt. *Revue de l'Aluminium*, v. 34, July-Aug. 1957, p. 721-733.

16047* (German.) Determining the Adhesion of Enamel. **Beitrag zum Ermitteln des Haftvermögens von Emails.** Ernst A. Franke. *Sprechsaal*, v. 90, July 1957, p. 347-348.

Adhesion was quantitatively determined by means of compression, bulging, tension and deflection tests, for the outside and inside enamel layers, separately or together, of cylindrical containers.

16048 Water Paint for Metal Parts. *Steel*, v. 141, Aug. 5, 1957, p. 88.

This fire-safe product has the durability of thinner-based paints, is quick drying, and nonvolatile.

16049 News Ways to Fight Corrosion. II. *Steel*, v. 141, Sept. 2, 1957, p. 158-160.

Coating systems of epoxy, vinyl, polyurethane, synthetic rubber, coal tar, and silicone components are discussed.

See also: **15660** (V_2O_5-opacified white enamels); **16125** (events at a scratch-line); **16136** (oxide films on Al alloys); **16541** (cathodic sputtering of Ag, Au, and Pt at 5 atm.); **16615** (electrical properties of sprayed metal coatings); **16644** (magnetic properties of Ni and Fe coatings); **16673** (glassy surface on dies in use); **16674** (coatings for wire); **16947** (epoxide resins in inks).

CONTROL SYSTEMS, COMPUTERS, AND SYSTEMS ENGINEERING

16050 Analysis of an Electrical Flight-Control System for Interceptor-Type Aircraft. E. Price and R. Westerwick. *Aeronautical Engineering Review*, v. 16, Aug. 1957, p. 63 + 5 pages.

16051* Some Statistical Applications of Electronic Computers. Stephen Lipton. *Applied Statistics*, v. 6, June 1957, p. 102-113 + 1 plate.

Terminology; computations previously carried out on desk calculators; input of data; fitting of probit lines; multiple regression; heavy computational problems; mathematically intractable problems; analysis of survey data; operational routines.

16052 Making Your Analogue Computing Facility Mobile. O. J. Sullivan. *Automatic Control*, v. 7, Aug. 1957, p. 50-53.

General techniques employed in setting up a mobile computer at Chance Vought Aircraft Co.

16053* Steel Casting Process Has Centralized Control of Process Variables. *Automation*, v. 4, Aug. 1957, p. 60-62.

Continuous process requires instrumentation to control temperature, tilt, weight, and speed.

16054* Data Reduction for Optimum Plant Efficiency. II. Applications. J. H. Whitaker. *Automation Progress*, v. 2, Aug. 1957, p. 368-371.

An account of applications and possibilities for automatic control, with details of the way in which deviations from process tolerances are detected and measurements are presented.

16055* The Inchworm Actuator. *Automation Progress*, v. 2, Aug. 1957, p. 372-373.

A linear actuator for mechanisms requiring control from 0.000,005 to 0.0001 in.

16056* (Russian.) New Methods for Calculating the Parameters of an Automatic Control System Containing Magnetic Amplifiers. **Novye metody rascheta parametrov sistem avtomaticheskogo regulirovaniia, soderzhashchikh magnitnye usiliteli.** A. G. Ivakhnenko and N. V. Petina. *Avtomatika*, 1957, no. 1, Mar. 20, p. 45-61.

16057* (Russian.) Methods of Regulating the Equivalent Transfer Function Adjusting T-Type RC-Carrier Frequency Circuits. **Metody regulirovki ekvivalentnoi peredatochnoi funktsii korrektiruiushchikh T-obraznykh RC-konturov nesushchei chastoty.** G. F. Zaitsev. *Avtomatika*, 1957, no. 2, June 6, p. 49-69.

16058 Integrated Data Processing. William A. Crichley. *Chemical Engineering Progress*, v. 53, July 1957, p. 338-341.

Techniques and equipment commonly associated with IDP and their application to a system in which all documents directly relating to sales order, shipping, and billing are semi-automatically prepared and statistical data for sales and inventory reporting are produced effortlessly as by-products.

16059* Transistor NOR Circuit Design. William D. Rowe and George H. Royer. *Communication and Electronics*, 1957, July, p. 263-267.

Design for a single logic element which combines well in logic configurations with a minimum of concern for matching and element loading.

16060* Moment Detection and Coding. J. J. Slade, Jr., L. F. Nanni, S. Fich, and D. A. Molony. *Communication and Electronics*, 1957, July, p. 275-279.

A method of detecting the characteristics of an electrical pulse by means of moments that are integrals of the instantaneous pulse amplitude and integral powers of time.

16061 Computing-Control Applied to Wind Tunnels. David A. Lieberman. *Control Engineering*, v. 4, Sept. 1957, p. 134-137.

Three problems in continuous and blowdown wind tunnels lend themselves to that area of computing-control handled by a controller and an assortment of common transducers and circuits: surge control to protect air compressors, correcting for variations in gain, and computing the density corrections for the compressed air.

16062 Computing-Control Applied to an Airborne Fire-Controller. Robert C. Pfister and E. Edward Buder. *Control Engineering*, v. 4, Sept. 1957, p. 138-140.

Computer control of airborne gunnery systems represents a mature application of computers to process control. The particular system discussed tracks another aircraft, determines ballistic and kinematic effects, and computes the necessary prediction angle for a projectile.

16063 From Controller Output to Process Actuation. John M. Salzer. *Control Engineering*, v. 4, Sept. 1957, p. 183-189.

Feedback control theory, power-engineering practice, and complete understanding of the application must be combined to yield suitable results.

16064* Automatic Tester Simulates Circuits for Control Panels. E. J. Loeffler and J. R. Longenecker. *Electrical Manufacturing*, v. 60, Aug. 1957, p. 97-101.

Homemade system, the heart of which is a motor driven cam drum with associated limit switches, checks out a complicated machine tool control panel in minutes prior to assembly on the machine. Simulated circuit principles are demonstrated by case history.

16065* Production Testing of Servomechanisms. H. R. Walker. *Electrical Manufacturing*, v. 60, Aug. 1957, p. 114-118.

For routinized testing and calibration of components and elements of complete servo systems, methods are derived from rigorous control theory. Illustrative loops and graphs are included to support the reasoning and as specific references for engineers having the problem of devising technically sound production test methods which are usable by medium-skilled production personnel.

16066* A Critical Evaluation of High-Precision Electromechanical Linear Measuring Systems. Frans Brouwer. *Electrical Manufacturing*, v. 60, Aug. 1957, p. 128-141.

A frank discussion of accuracy, linearity, resolution, and sources of error in position-measuring transducers suitable for closed-loop machine tool controls.

16067 The Design of the Pegasus Computer. I. T. G. H. Baunholtz. *Electronic Engineering*, v. 29, Aug. 1957, p. 358-363.

Programmer's analysis of machine design. Some details of the order-code. (To be continued.)

16068 LACE. The Luton Analog Computing Engine. II. Non-Linear Units Used in a General Purpose Analogue Computer. J. C. Jones and D. Readshaw. *Electronic Engineering*, v. 29, Aug. 1957, p. 380-385.

An electronic multiplier; an electronic general purpose function generator.

16069 Missile Control Demands Stabilization and Guidance. George Reehl. *Electronic Industries & Tele-Tech*, v. 16, Sept. 1957, p. 54 + 7 pages.

Control about 3 axes, roll, pitch, and yaw, must be accurately maintained by the autopilot; aiming signals must be developed and introduced by the radio guidance system. A hypothetical system is designed, developed, and tested.

16070 Automatic Data Handling. A Pre-Requisite to Automation. C. A. Laws. *Industrial Chemist*, v. 33, Aug. 1957, p. 383-391.

The measurement of process variables and the rapid recording of these measurements in digital form is the objective of a data-reduction system. Operation of these systems; industrial applications.

16071 Multihole Ferrite Core Configurations and Applications. H. W. Abbott and J. J. Suran. *I.R.E., Proceedings*, v. 45, Aug. 1957, p. 1081-1093.

Combined gating and memory functions may be performed by the use of transfluxors.

16072 Requirements for a New Universal Air Traffic Control Simulator. S. M. Berkowitz and R. S. Grubmeyer. *Institute of Radio Engineers, Transactions on Aeronautical and Navigational Electronics*, v. ANE-4, June 1957, p. 59-64. (TK1 In6.6a Vis.)

Some of the more important requirements are presented and discussed both in terms of their necessity and their technical feasibility. The requirements are broken down into four areas: target generation, communications, displays, and data reduction and analysis.

16073* A Magnetic-Core Matrix Store With Direct Selection Using a Magnetic-Core Switch Matrix. W. Renwick. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, Suppl. no. 7, 1957, p. 436-444.

Details of the magnetic-core matrix store developed for a large high-speed digital computer, Edsac II.

16074* A Matrix Store for Data Rate Conversion. C. J. Quartly, A. L. Cain, and R. W. Clarke. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, Suppl. no. 7, 1957, p. 457-463.

Description of a parallel-access ferrite-core store which forms part of a data-handling system. The storage capacity is 13,750 binary digits.

16075* A Digital Computer Based on Magnetic Circuits. B. Bambrough. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, Suppl. no. 7, 1957, p. 485-490.

Deals with the arithmetic, controlling circuits, and the storage registers of the Decca C1 digital computer.

16076* The Application of Square-Loop Ferrite Material in Data-Processing Systems. E. P. G. Wright. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, Suppl. no. 7, 1957, p. 502-511.

16077* A Core-Transistor Logical Element. D. Eldridge and P. F. Dorey. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, Suppl. no. 7, 1957, p. 512-522.

Square-loop magnetic-core/junction-transistor circuit-element is suitable for operation in complex logical systems at medium digit rates. Temporary storage between logical operations is obtained by virtue of the remanent property of the core.

16078 (French.) Electromagnetic and Ultrasonic Automatic Control of Mild Steel Billets in the Mill. **Inspection automatique en usine de billettes d'acier doux par les méthodes électromagnétique et ultrasonore.** V. Husarek and L. Beaujard. *Institut de Recherches de la Sidérurgie, Publications*, ser. A, no. 162, May 1957, 12 p. (Reprinted from *Revue de Métallurgie*, v. 54, Feb. 1957, p. 135-146.) (TN602 In7p Vis.)

Checking and sorting billets for a rod rolling plant. Electromagnetic and supersonic apparatus and methods used. Technical and economical results. Design of a mechanized plant.

16079* P. E. P. A Portable Electric Punch for Recording Traffic Data Directly Into Punched Cards. P. B. Ellson. *Instrument Practice*, v. 11, July 1957, p. 714-724.

Application of the above to British automotive traffic control.

16080* The Impact of Automation on the Plant Engineer. J. F. Coales. *Instrument Practice*, v. 11, July 1957, p. 725-731.

A brief history and philosophy of automation.

16081 Demonstrating System Reliability by the Sequentila Probability Ratio Test. Bernard Tiger and William H. Brewington. *Jet Propulsion*, v. 27, Aug. 1957, p. 890 + 2 pages.

Sample size is not predetermined but, the testing is continued and the results analyzed after each system is tested, until the results are sufficient to indicate a decision.

16082* Computer Valves and Cathode Interface Impedance. J. Seymour. *Journal of Electronics and Control*, v. 3, July 1957, p. 107-125.

The unpredictable nature of the interface growth makes it desirable to eliminate this problem.

16083* The Place of Analogue Computers in Reactor Control. J. Walker. *Journal of Electronics and Control*, v. 3, July 1957, p. 125-136.

Computer is used to give simultaneous solution of a large number of differential equations.

16084 Quantitative Design of Servo Systems by Frequency-Response Methods. III. Gain-Phase Relationships. J. M. Nightingale. *Machine Design*, v. 29, Aug. 8, 1957, p. 90-93.

An analysis of the exact nature of relationships between gain and phase characteristics of practical components and their implications in system design.

16085 Contouring From Computers. John L. Dutcher. *Machinery*, v. 63, Aug. 1957, p. 151-158.

Compares costs of new and old systems. Differences between numerical positioning control and numerical contouring are emphasized.

16086* In-Line Transfer Machining on the Ferguson Tractor. V. Five Transfer Machines as Integrated Unit. Peter Trippe. *Metalworking Production*, v. 101, Aug. 9, 1957, p. 1363-1369.

Automatic handling including turning and repositioning is incorporated between machining operations.

16087 Servos. *Military Automation*, v. 1, July-Aug. 1957, p. 200-201.

Explanation of servo system operation. (To be continued.)

16088* Electric Analog Studies of the Transient Behavior of Heat Exchangers. Victor Paschkis and Joseph W. Hlinka. *New York Academy of Sciences, Transactions*, v. 19, June 1957, p. 714-730.

Two approaches to the problem are considered.

16089 New Digital Computer Is Especially Designed for Process Control. D. H. Stormont. *Oil and Gas Journal*, v. 55, Sept. 2, 1957, p. 151-152.

Description of a digital computer designed for automatic control of refinery and petrochemical processes.

16090 Practical Automation. Lester R. Bittel, Morley G. Melden, and Robert S. Rice. 376 p. 1957. McGraw-Hill, New York. (T59.5 B54p Over.)

Automatic handling, processing, inspection, and communication; special problems, essential techniques, equipment and materials for automation.

16091 Switching-Logic Functions. Jack Sheets and Russell A. Brown. *Product Engineering*, v. 28, Aug. 1957, p. 196-200.

Application of static control devices for machine controls.

16092* Automation in Europe. T. W. Black. *Tool Engineer*, v. 39, Sept. 1957, p. 73-77.

Review of discussions at a recent Paris meeting on the current status of automation in Europe.

16093* The Analog Computer. An Engineering Tool. Charles W. Worley. *World Petroleum*, v. 28, July 1957, p. 59-63.

By simulating scale models, the analog permits engineers to solve problems of great complexity which would demand too many man-hours for normal engineering practice.

16094* (German.) Stabilization and Control of an Electromagnet Used in Magnetic Proton Resonance. **Stabilisierung und Steuerung eines Elektromagneten unter Verwendung der magnetischen Protonenresonanz.** H. Andresen. *Zeitschrift für Angewandte Physik*, v. 9, July 1957, p. 326-333.

Design for an experiments on a system by which the field of a 3 kw. electromagnet used for the study of magnetic nuclear resonances is controlled and stabilized.

See also: **15570** (aircraft systems engineering); **15692** (chemical process control); **15715** (automatic weighing equipment); **15864** (computer for chemical structure searching); **16094** (magnetic proton resonance electromagnet control); **16131** ("solion" control elements); **16195** (IRE National Convention Record); **16225** (control valves); **16268** (servos for combustion control); **16379** (neutron spectrometer with ferrite data storage); **16388** (liquid-level controller); **16531** (computers for electric arc furnaces); **16751** (quality control in automation); **16752** (automatic quality control); **16889** (computers for machine-load forecasting); **16892** (computers in business offices); **17025** (digital computers to calculate piping flexibility).

ELECTRICAL ENGINEERING

16095 Aluminium in Electrical Engineering. An Introductory Survey. 72 p. 1957. Aluminium Development Assn., London. (TN775 A181.7e)

Electrical, mechanical, chemical, and fabricating properties of aluminum; uses in overhead conductors, insulated cables, industrial and domestic applications, transport applications, telecommunications, stationary plant, and rotating machinery; processes used in joining.

16096* A Null Instrument for Accurate Measurement of Small A. C. Currents. C. T. J. Alkemade and W. J. Lavèn. *Applied Scientific Research*, v. 6, sec. B, no. 5, 1957, p. 337-352.

The design, adjustment, and performance of the apparatus are treated. The use of a linear rectifying meter instead of a synchronous meter, in direct-reading measurements, is discussed with respect to the signal-to-noise ratio.

16097* The Overload Capacity of Mutators. T. Wasserrab. *Brown Boveri Review*, v. 44, Mar. 1957, p. 134-141.

The overload capacity determined from the rated load capacity is largely dependent on the probability of backfire. The various national standards are compared with the results obtained and with one another.

16098* Auxiliary Drives in Hot-Rolling Mills. K. Heizmann. *Brown Boveri Review*, v. 44, Mar. 1957, p. 146-154.

The elements employed must be such that the stipulated conditions are fulfilled with the minimum of expense.

16099* New Concepts in Evaluating Electric Equipment Insulation Systems—The Problems Encountered. M. L. Manning. *Communication and Electronics*, 1957, July, p. 348-355.

Insulation performance in the light of increased power demands is considered.

16100 Conference on Electrical Insulation of the Division of Engineering and Industrial Research, Annual Report 1956. 63 p. 1957. National Academy of Sciences, Washington, D. C. (TK3401 N21a Vis.)

A compilation of 18 papers presented at the 1956 annual meeting.

16101* Magnetizing Unsymmetry in Three-Phase Core-Type Transformers. II. J. E. Parton. *Electrical Energy*, v. 1, Aug. 1957, p. 377-384.

A listing of experimental results. (To be continued.)

16102 The Use of SF_6 for High-Power Arc Quenching. W. M. Leeds, T. E. Browne, Jr., and A. P. Strom. *Electrical Engineering*, v. 76, Sept. 1957, p. 788-791.

Sulfur hexafluoride gas possesses a phenomenal arc-extinguishing ability and high dielectric strength. Experimental test data support the theory that this gas not only is a better dielectric than air at the same pressure, but also can interrupt the same short-circuit power as compressed air and at lower blast pressures.

16103* Design Procedures for Special Type High-Temperature Transformers. II. Irving Remis. *Electrical Manufacturing*, v. 60, Aug. 1957, p. 119 + 9 pages.

Specific design procedures include current limiting transformers, current limiting transformers with unbalanced magnetization, and vibrator power supply transformers. Design example worked out for 400-cycle transformer at 200 C.

16104* Regulation Systems for A-C Generators. Harris Shapiro. *Electrical Manufacturing*, v. 60, Aug. 1957, p. 142-146.

Simple and economical methods of achieving improved regulation in alternators in the 10- to 100- kva. size ranges are outlined and compared for their merits in particular applications.

16105* Coordinate Generator Prewarming With Controlled Turbine Starting. C. B. Scharp. *Electrical World*, v. 148, Aug. 19, 1957, p. 88-91.

Turbine temperature rules; equations developed to find field current and duration of prewarming period.

16106* Study Effect of Area Interconnections. L. K. Kirchmayer, A. G. Mellor, and H. O. Simmons, Jr. *Electrical World*, v. 148, Sept. 2, 1957, p. 84-87.

An approach to the selection of economic generator sizes for interconnected companies.

16107* (Russian.) Induction Law for a Capacitance Machine. **Zakon induktsii dlia emkostnoi mashiny.** A. A. Bal'chitis. *Elektrichestvo*, 1957, no. 7, July, p. 11-14.

Theory and method of operation. Derivation of a formula expressing the induction law.

16108* (Hungarian.) Torque of a Synchronous Motor at Half Speed When Started as an Asynchronous One. **Aszinkron motorként indított szinkron motorok nyomatéka fél fordulatszám közelében.** K. Pál Kovács and István Rácz. *Elektrotechnika*, v. 50, Jan.-Feb. 1957, p. 2-11.

Simple graphical method enables determination of the lowest torque to be expected in the vicinity of half speed while starting.

16109* (Hungarian.) Current Displacement in Round Massive Bars Embedded in the Slots of Electrical Machines. **Áramkiszorítás villamos gépek körkeresztmetszetű hornyaiba ágyazott tömör vezetőkben.** Róbert Tuschák. *Elektrotechnika*, v. 50, Jan.-Feb. 1957, p. 25-34.

Method for determining analytically the increase of resistance and decrease of reactance for massive bars of circular cross section embedded in slots. Calculations for double squirrel cage rotors are also made.

16110* (German.) Possibilities and Outlook for a Complete Solution of the Heat Problem in Electric Machines. **Möglichkeiten und Aussichten einer unbeschränkten Lösung des Wärmeproblems von elektrischen Maschinen.** J. Hak. *Elektrotechnik und Maschinenbau*, v. 74, July 15, 1957, p. 305-311.

Individual problems, various methods, basis for calculation, difficulties involved, questions, and suggestions.

16111* (German.) Properties and Tests of Silicone Insulating Materials. **Eigenschaften und Prüfungen von Silikon-Isolierstoffen.** H. Rothert. *Elektrotechnik und Maschinenbau*, v. 74, Aug. 1, 1957, p. 326-335.

Electrical testing and properties of silicone rubbers and lubricants.

16112* (German.) Processes for Evaluating and Testing High-Voltage Insulation of Electric Machines. **Verfahren zum Beurteilen und Prüfen der Hochspannungs-Isolierung elektrischer Maschinen.** Hartmut Meyer. *ETZ, Elektrotechnische Zeitschrift*, v. 9, Ausgabe B, July 1957, p. 289-293.

Advantages and disadvantages of different processes.

16113* (German.) Use of the Piezoelectric Measuring Technique to Indicate Tension Distribution in High-Voltage Power Switches. **Anwendung der piezoelektrischen Messtechnik zum Aufzeichnen des Druckverlaufs in Hochspannungs-Leistungsschaltern.** Kurt Autenrieth and Heinz Voigt. *ETZ, Elektrotechnishe Zeitschrift*, v. 78, Ausgabe A, Aug. 1957, p. 572-577.

16114* Insulation Engineering Fundamentals. XIX. Shipment, Storage, and Tropical Service Insulation Problems. Graham Lee Moses. *Insulation*, v. 3, Aug. 1957, p. 20-22.

16115* Compatibility in Motor Insulation Systems. Harry R. Sheppard and Gerald A. Mullen. *Insulation*, v. 3, Aug. 1957, p. 28-30.

Concludes that compatibility of the components of motor insulation systems is a major factor in achieving the optimum life of motors.

16116* (Russian.) Application of the Reflection Theory to the Construction of Electromagnetic Fields. **O primenenii teorii otobrazhenii pri modelirovanii elektromagnitnykh polei.** V. V. Nitsetskii. *Latvijas PSR Zinātnu Akademijas, Vestis*, no. 6, 1957, p. 87-94.

Conditions for replacement of an anisotropic heterogeneous medium, with the help of geometrical field reflections.

16117* Electrical Insulation and the Hermetic Motor. R. T. Divers. *Refrigerating Engineering*, v. 65, Aug. 1957, p. 33 + 8 pages.

A treatise on the problem of isolating the insulation system from the adverse effects of the refrigerant, water, oil, and metal particle atmosphere.

16118* (English.) **Novel Test Equipment for Generator-Protection Relays.** Erwin Zurowski. *Siemens Review*, v. 24, Jan. 1957, p. 13-17.

Special equipment has been developed which allows the relays to be tested not only when the generator is isolated but also when it is running. In the test operations, the tripping circuits of the protective relay are opened before the relay itself is operated by the testing current.

See also: **15941** (electrochemical behavior of boron); **16028** (insulating varnish); **16195** IRE National Convention Record); **16291** (atmospheric electricity); **16380** (potential dividers); **16470** (electrical contact materials of Pt metal); **16953** (insulation coatings); **16971** (dielectric properties of plastics); **16978** (silicone polymer insulation).

ELECTROCHEMISTRY

16119 Anodic Stripping Voltammetry With Mercury Electrodes—Potential-Step and Current-Step Methods. Gleb Mamontov, Paolo Papoff, and Paul Delahay. *American Chemical Society, Journal*, v. 79, Aug. 5, 1957, p. 4034-4040.

Anodic stripping is carried out either by sudden switching of potential or by passing a constant current through the cell. A theoretical analysis is developed for both methods for conditions of semi-infinite linear diffusion.

16120* (Dutch.) Automatic Voltage Regulation During Electrolysis. **Automatische spanningsregeling bij elektrolyse.** J. Krugers. *Bedriff en Techniek*, v. 12, no. 285; *Electronic Section*, v. 10, no. 232, Aug. 10, 1957, p. 141 + 5 pages.

Study of an apparatus for the electromechanical regulation of electrolysis. The electrolytic voltage can be maintained between 0 to 4v; other technical and economical advantages.

16121* The Protection of Threaded Parts by Electroplating. E. A. Ollard. *Corrosion Prevention and Control*, v. 4, Aug. 1957, p. 41-44.

Problem of plated screw threads; methods used for plating screws; control procedures.

16122 The Electrochemical Behavior of Aluminum Potential-pH Diagram of the System Al-H_2O, at 25° C. E. Deltombe and M. Pourbaix. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-50336, May 1957, 25 p. (UF767 Un3.1hw Contin.)

The equilibrium diagram of this system is developed from the standard free energies of the constituents, and the general electrochemical behavior of aluminum is deduced from the diagram.

16123* Aluminium Anodising Based on American Experience. *Industrial Finishing (London)*, v. 9, July 1957, p. 692-695.

Describes what is known commercially as the "Alumilite" process.

16124* The Effect of Silicon in a Low-Alloy Steel on the Adhesion of Heavy Nickel Plating. J. J. Dale and H. K. Lutwak. *Institute of Metal Finishing, Bulletin*, v. 7, Summer 1957, p. 133-138.

Improved adhesion of deposited Ni after the anodically etched steel was treated with NaOH solution which dissolves silicic acid.

16125* Events at a Scratch-Line. U. R. Evans. *Institute of Metal Finishing, Bulletin*, v. 7, Summer 1957, p. 139-166.

Statistical experiments have shown that the probability of corrosion at a scratch-line wetted with a liquid standing on the border-line between the corrosive and the passivating classes decreases steadily with the period of air-exposure before wetting; corrosion at one scratch-line depresses the probability of corrosion starting at a neighboring scratch-line.

16126 Two Tanks Do Work of Ten in Surface Treatment. C. J. Riddle. *Iron Age*, v. 180, Aug. 22, 1957, p. 104-105.

The use of automatic cycling equipment reduces the tank requirements in anodizing of Al aircraft components.

16127 The Mechanism of the Hydrogen Evolution Reaction on Platinum, Silver and Tungsten Surfaces in Acid Solutions. J. O'M. Bockris, I. A. Ammar, and A. K. M. S. Huq. *Journal of Physical Chemistry*, v. 61, July 1957, p. 879-886.

Reaction parameters were determined as a function of current density (c.d.) pH, salt addition, mode of electrode preparation, aging and degree of preëlectrolysis; and as a function of c.d., and degree of preëlectrolysis for W and Ag.

16128 Voltammetry at Controlled Current With Dropping Mercury Electrode. Mitsugi Senda, Tomihito Kambara, and Yoshio Takemori. *Journal of Physical Chemistry*, v. 61, July 1957, p. 965-967.

A theoretical analysis is developed for current scanning polarography. The rate of current variation is such that the current during drop life is essentially constant. Equations are derived for potential-time and current-potential curves for electrolysis of a solution containing N reducible substances.

16129 Alternating Current Chronopotentiometry—Reversible Electrode Process. Yoshio Takemori, Tomihito Kambara, Mitsugi Senda, and Isamu Tachi. *Journal of Physical Chemistry*, v. 61, July 1957, p. 968-969.

A method of electrolysis at controlled current is discussed in which an a.c. is superimposed upon the constant electrolysis current. The alternating component of the potential of the polarized electrode becomes relatively very large at the transition time, thus allowing more precise determination of the transition time than by conventional chronopotentiometry.

16130* (Russian.) Electron Microscopic and X-Ray Analyses of Disperse Phases of Lead-Tin Alloy Organosols. **Elektronnomikroskopicheskie i rentgenograficheskie issledovaniia dispersnykh faz organozolei splavov svinets-olovo.** E. M. Natanson, V. P. Chalyi, N. N. Kozachek, and A. P. Kaban. *Kolloidnyi Zhurnal*, v. 19, May-June 1957, p. 319-323 + 2 plates.

The process of colloid particle formation of Pb-Sn alloys at the cathode was studied with respect to the atomic ratio in the aqueous layer of the electrolyte baths and to the current density at the cathode. It was found that increase in current density at the cathode favors the formation of colloid particles of the alloys.

16131 Solions. *Machine Design*, v. 29, Aug. 22, 1957, p. 102-105.

A series of new electrochemical control elements, highly responsive to changes in temperature, pressure, light, sound, or motion.

16132* (Hungarian.) The Zinc-Silver Battery. **A cink-ezüst akkumulátor.** Ernő Zöld and László Kiss. *Magyar Kémiai Folyóirat*, v. 63, Feb.-Mar. 1957, p. 93.

Brief outline of the production and properties of a high-capacity cell.

16133 Density and Porosity of Anodic Coatings on Aluminum. Ralph B. Mason. *Metal Finishing*, v. 55, Aug. 1957, p. 55 + 3 pages.

Unsealed sulfuric acid anodic coatings on 1100-H16 Al, prepared under standard conditions, had a density of 2.96 and a pore volume of 15.8%; the corresponding water sealed coatings had a density of 2.65. Similar coatings of 2024-T3 Al have lower densities but higher pore volumes, namely about 47%.

16134 Application of Ultrasonics in the Electroplating Industry. T. J. Bulat. *Metal Finishing*, v. 55, Aug. 1957, p. 65-67.

Uses in activation of the bath and cleaning prior to plating.

16135 Electrorefining Titanium. *Metal Industry*, v. 91, July 19, 1957, p. 47-48.

Electrolyte preparation, cell design, and current density are studied.

16136 Thick Oxide Films on Aluminium Alloys. J. M. Kape. *Metal Industry*, v. 91, Aug. 2, 1957, p. 90-92.

Anodic coatings were produced on several cast and wrought Hiduminium alloys, using 200 to 3,600 watts and treatment times of 5 to 70 min. Data are tabulated. (To be continued.)

16137* Electro-Forming Thin Films to Close Tolerances. Robert W. Hampson. *Metalworking Production*, v. 101, Aug. 2, 1957, p. 1330-1332.

16138* (Russian.) Protection of Petroleum Equipment Against Wear by Means of Electrolytic Boriding. **Povyshenie iznosoustoichivosti neftianogo oborudovaniia metodom borirovaniia.** G. V. Myl'nikov. *Neftianoe Khoziaistvo*, v. 30, July 1957, p. 4-8.

Description of method and range of conditions under which maximum benefit could be derived from boriding treatment.

16139 A Study of Cadmium-Tin and Zinc-Tin Alloy Electrodeposits. Bennie Cohen. *Plating*, v. 44, Sept. 1957, p. 963-968.

The Cd-Sn coating was equal or superior to Cd under many different test conditions. The Zn-Sn coating was inferior to both in all tests performed.

16140 Electrochemistry and the Plater. I. Fred G. Brune. *Products Finishing*, v. 21, Aug. 1957, p. 44-48.

Some principles of electrochemistry for the electroplater.

16141* (Russian.) Effect of Naphthalenesulfonic Acids on the Electrical Precipitation of Nickel. **Vliianie naftalinsul'fokislot na protsess electroosazhdeniia nikelia. I.** Cathodic Polarization. **Katodnaia poliarizatsiia.** A. V. Pamfilov and O. E. Panchuk. *Ukrainskii Khimicheskii Zhurnal*, v. 23, no. 3, 1957, p. 391-396.

The small effect on the amount of cathode polarization in electrical precipitation of Ni at 25, 40, and 55 C in an interval of current density 0.1-2 amps. per sq. dm. was explained by reduction of sulfonic acids, formation and reduction of Ni_2S_4.

16142* (German.) The Haeffner Effect in Tin, Cadmium, and Zinc. **Haeffner-Effekt in Zinn, Cadmium und Zink.** Alex Lodding. *Zeitschrift für Naturforschung*, v. 12a, July 1957, p. 569-573.

Direct current is passed through capillaries with molten metals. Light isotopes accumulate at the anode. Mass effect increases with temperature in Zn and not in Cd.

16143* (Russian.) Effect of Camphor Concentration on the Mercury Electrocapillary Curve and on the Electrode Processes at a Cadmium Amalgam Dropping Electrode. **Vliianie kontsentratsii kamfary na elektrokapilliarnye krivye na rtuti i na elektrodnye protsessy na kadmievom amal'gamnom kapel'nom elektrode.** A. G. Stromberg and L. S. Zagainova. *Zhurnal Fizicheskoi Khimii*, v. 31, May 1957, p. 1042-1055.

16144* (Russian.) The Causes of the Anodic Effect in the Electrolytic Production of Aluminum. **Prichiny vozniknoveniia anodnogo effekta pri elektroliticheskom poluchenii aliuminiia.** L. N. Antipin and N. G. Tiurin. *Zhurnal Fizicheskoi Khimii*, v. 31, May 1957, p. 1103-1110.

The anodic effect in cryolite alumina melts owes its appearance to the discharge of fluorine containing ions at the anode. The compounds COF_2 and CF_4 may form at the carbon anode.

See also: **15802** (analysis of cyanide baths); **15803** (determination of Ni in Cd an Au plating baths); **16029** (electrochemical conversion coatings); **16415** (wear of chrome plate); **16504** (salt-spray testing of electroplate); **16575** (elimination of surface blemishes in Zn die castings); **16618** (properties of electroplate); **16709** (structure of Cu-Zn electroplate); **16985** (oxidation of CN wastes); **16986** (chromic acid recovery).

ELECTRONICS

16145* (German.) The Theory of the Electrical Conductivity of Semiconductors at High Frequencies. **Zur Theorie der elektrischen Leitfähigkeit von Halbleitern bei hohen Frequenzen. I.** Hubertus Stolz. *Annalen der Physik*, v. 19, nos. 6-8, 1957, p. 394-400.

Assuming the existence of a uniform relaxation time for the electron-grid alternating effect, the Boltzmann equation is solved for an electric field harmonically dependent on time. Resulting integral expressions for complex electrical conductivity are evaluated for nonpolar and polar semiconductors.

16146* The Thermoelectric Transistor. A possible Batteryless Amplifying Semiconductor Device. Andreas Kelen and Per Swedberg. *Applied Scientific Research*, v. 6, sec. B, no. 5, 1957, p. 369-378.

Criteria are derived for the choice of material, geometrical shape, and heat flow through an amplifying device.

16147 Equalizer Design. I. Norman H. Crowhurst. *Audio*, v. 41, Aug. 1957, p. 17-19.

Derivation of formulas for calculating equalizers of the type used in constant impedance circuits and other audio applications. (To be concluded.)

16148 How the Maser Operates. II. Maser's Potential Rests on Further Work. Richard W. Damon. *Aviation Week*, v. 67, Aug. 26, 1957, p. 91 + 5 pages.

Increasing pace of research in atomic amplifiers, spurred by their potentialities for improving radar, communications and countermeasures equipment performance, has produced a variety of techniques and experimental devices.

16149 Voice-Actuated Machines: Problems and Possibilities. E. E. David, Jr. *Bell Laboratories Record*, v. 35, Aug. 1957, p. 281-286.

16150 A Broad-Band Microwave Circulator. E. A. Ohm. *Bell Laboratories Record*, v. 35, Aug. 1957, p. 293-297.

A device was made for routing microwave energy over a variety of waveguide transmission paths utilizing the "dielectric waveguide effect" of ferrite devices.

16151 Noise Spectrum of Electron Beam in Longitudinal Magnetic Field. I. The Growing Noise Phenomenon. II. The UHF Noise Spectrum. W. W. Rigrod. *Bell System Technical Journal*, v. 36, July 1957, p. 831-878.

The experimental measurements show the growing noise pattern to be the result of a two-stage process. Its primary cause is rippled-beam amplification of noise fluctuations over a wide band of microwave frequencies. In the second stage, noise energy is transferred to lower frequencies, due to intermodulation and other non-linear processes within the gain band.

16152 Self-Timing Regenerative Repeaters. E. D. Sunde. *Bell System Technical Journal*, v. 36, July 1957, p. 891-937.

The regeneration characteristics of such repeaters as determined by various design parameters are investigated, together with the cumulation of timing deviations in repeater chains and the circuit requirements that must be met to insure satisfactory performance.

16153 High-Voltage Conductivity-Modulated Silicon Rectifier. H. S. Veloric and M. B. Prince. *Bell System Technical Journal*, v. 36, July 1957, p. 975-1004.

The characteristics of devices fabricated from high-resistivity compensated, floating-zone refined, and gold-doped Si are presented. The surface limitation to high inverse voltage rectifiers is discussed.

16154* Removal of Heat From Sealed Miniature Equipment. F. P. Newell. *British Communications & Electronics*, v. 4, Aug. 1957, p. 468-475.

Postulates theory that design should be based on thermal conduction to such external surfaces as are in contact with free air.

16155* Photomultiplier Tubes. J. Sharpe. *British Communications & Electronics*, v. 4, Aug. 1957, p. 484-492.

The various types of photomultiplier tube, their design and use. A table of representative tubes available in Britain.

16156 Measurements of the Impedance Parameters of Junction Transistors. E. E. Ward. *British Journal of Applied Physics*, v. 8, Aug. 1957, p. 329-331.

Equipment for making null measurements. Studies on collector open-circuit are included and typical results at frequencies up to 30 kc. per sec. are given.

16157 The Emission From Oxide Cathodes in Low Pressure Discharges. M. A. Cayless. *British Journal of Applied Physics*, v. 8, Aug. 1957, p. 331-336.

Shows that the various secondary and field emission processes must play a prominent part in the normal operation of these cathodes which need not necessarily be particularly good thermionic emitters.

16158* Analysis of the Full-Wave Magnetic Amplifier Circuits Considering the Change of the Width of the Dynamic Hysteresis Loop. Tadashi Kikuchi. *Communication and Electronics*, 1957, July, p. 241-249.

16159* Transistor 2-Terminal Switches. Abraham Har'el. *Communication and Electronics*, 1957, July, p. 328-338.

Explains the blocking-voltage concept and its application.

16160* A New Voltage-Divider Circuit for Semiconductor Rectifiers. I. K. Dortort. *Communication and Electronics*, 1957, July, p. 356-358.

A relatively simple and inexpensive application of semiconductor rectifiers to high power units without sacrifice of efficiency.

16161* (French.) Particular Behavior of Gas Triodes Under Relaxation Operating Conditions. **Sur un comportement particulier des triodes à gaz en régime relaxé.** Jean Lagasse, Robert Lacoste, and Georges Giralt. *Comptes Rendus*, v. 245, July 22, 1957, p. 412-414.

Gas triode behavior in a relaxation oscillator. Minimum voltage at thyratron terminals can become practically null for certain values of the grid circuit time constant.

16162* The Spacistor—A New Kind of Semiconductor Amplifier. Neil D. Macdonald. *Computers and Automation*, v. 6, Aug. 1957, p. 6-9.

Spacistor will amplify at frequencies up to 10,000 Mc. and temperatures to 500 C.

16163* Luminescence Decrease of Phosphor Screens by Electron Burn. K. H. J. Rottgardt. *Electrical Communication*, v. 34, June 1957, p. 130-135.

Studies on cathode-ray-tube nonaluminized screens. Electrons ionize the lattice structure elements and thus create discontinuities representing deep traps in the band model of the crystal phosphors where transitions can occur without radiation.

16164* Minitrack System Design Criteria. J. T. Mengel. *Electrical Engineering*, v. 76, Aug. 1957, p. 666-672.

Operating principles of the radio phase-comparison angle-tracking system known as Minitrack. Design criteria for the system with reference to the severe weight and size limitations and altitude limits of the Vanguard satellite.

16165* Measurement of Resistor Temperature Coefficient. E. Thompson. *Electrical Manufacturing*, v. 60, Aug. 1957, p. 106 + 4 pages.

Problems involved in temperature coefficient measurements of resistors include the cumulative effect of small errors in measurement of temperature and resistance, shown graphically for standard temperature increments. A precision resistance measurement bridge is also described.

16166 A Cathode-Ray Tube Oscilloscope for Use in Millimicrosecond Pulse Techniques. J. W. Armitage, G. Gaskin, and K. Phillips. *Electronic Engineering*, v. 29, Aug. 1957, p. 364-367.

Time-base employs a thyratron trigger and a hard valve sweep circuit with a continuously variable sweep speed from 3μ sec. down to 15mμ sec. with a scan of approximately 2 kv.

16167 Waveguide Power Dividers. T. G. Hame. *Electronic Engineering*, v. 29, Aug. 1957, p. 368-373.

Development of a new type of wideband power divider designed for use in aerial feeding systems.

16168 A Transistor D. C. Chopper Amplifier. P. L. Burton. *Electronic Engineering*, v. 29, Aug. 1957, p. 393-397.

Use of a transistor as a chopper and as a synchronous rectifier; design procedure; performance.

16169* Artificial Transmission Lines. A. C. Hudson. *Electronic & Radio Engineer*, v. 34, Aug. 1957, p. 297-299.

Some relations are derived between the dimensions of the coils for negative mutual inductance transmission lines and the constants of such lines.

16170* Transistor RC Oscillators. M. K. Achuthan. *Electronic & Radio Engineer*, v. 34, Aug. 1957, p. 309-310.

The design of a sine-wave transistor oscillator incorporating a zero phase-shift network.

16171 Automatic Changeover of Radio Transmitters. James H. Greenwood. *Electronics*, v. 30, Sept. 1, 1957, p. 138-142.

Completely automatic shift to emergency broadcast transmitter is achieved in less than 24 sec. after loss of regular transmitter carrier, making lost air time much less than is possible with ordinary remote manual control. Complete remote monitoring and remote control facilities are also provided at studio, with fail-safe provisions for both automatic and manual-remote modes of operation.

16172 Transistorized Multiplex Radio-Teletypewriter. Phillip G. Wray. *Electronics*, v. 30, Sept. 1, 1957, p. 150-154.

Up to four channels of teletypewriter signals are combined by time-division multiplex for transmission over a single radio communication circuit. Simplified ring counter and digital synchronizer contribute to high operating speed of 100 words per min.

16173 Pulse Generator Uses Junction Transistors. Edward J. Fuller. *Electronics*, v. 30, Sept. 1, 1957, p. 176-179.

Amplitudes of 28-v negative, 50-v positive with widths continuously variable from 1.0 to 10μ sec. and rise-decay time of 0.3μ sec. Internally generated repetition rates vary in steps from 50 to 5,000 pulses per sec. with external triggering by either positive or negative pulses, and 1 to 100μ sec. time delay internally.

16174 Voltage Regulator Uses Multivibrators. William A. Scism. *Electronics*, v. 30, Sept. 1, 1957, p. 184-186.

Astable multivibrator has square-wave output over frequency range of 100 to 3,600 c.p.s.; frequency is determined by magnitude of control voltage over 12-to-1 range. Pulse width of monostable multivibrator is varied over 10-to-280 μsec. range.

16175* (Russian.) Approximate Calculation of the Relative Power of Stray Radiations of Ultrashort-Wave Transmitters. **Priblizhennyi raschet otnositel'noi moshchnosti parazitnykh izluchenii ukv peredatchikov.** Ia. I. Efrussi. *Elektrosviaz'*, v. 11, no. 8, Aug. 1957, p. 13-19.

Stray radiations produced by the harmonics of the anode current of the first multiplication stage. Calculation of the passage of the harmonics through the oscillatory circuits admitting a superposition. Limiters and stages with overvoltage decrease stray radiations.

16176* (Italian.) Rules to be Used in Testing Radiophonic Frequency Modulation Receivers. **Norme per le prove sui ricevitori radiofonici a modulazione di frequenza.** Claudio Egidi, et al. *Elettronica*, v. 6, no. 2, 1957, p. 66-105.

Aim and use, acoustic and electrical fidelity. Acoustic stability. Sensitiveness and ground noise. Selectivity and interferences. Different frequencies.

16177* (German.) Diagrams of Energy Level Displacement in the Description of the Charging Processes in Storage Tubes. **Niveauverschiebungsdiagramme zur Beschreibung der Ladungsprozesse in Speicherröhren.** Max Knoll and Wolfgang Harth. *ETZ, Elektrotechnische Zeitschrift*, v. 78, Ausgabe A, Aug. 1957, p. 543-548.

16178* (German.) A Nonreciprocal Attenuator (Directional Conductor) for 4,000 Megacycles. **Ein nichtreziprokes Dämpfungsglied (Richtungsleitung) für 4GHz.** J. Deutsch and W. Haken. *Frequenz*, v. 11, July 1957, p. 217-220.

Principle and design of the above for the frequency range 3,800-4,200 Mc.

16179 Industrial Electronics Handbook. R. Kretzmann. 2nd Rev. Ed. 298 p. 1956. Philips' Technical Library, Eindhoven, Netherlands. (TK7815 K88i2)

A sound treatment of the scientific principles of vacuum and gas-filled electronic tubes and their basic circuits. The main type of application.

16180 Ion Oscillations in Electron Beam Tubes; Ion Motion and Energy Transfer. Robert L. Jepsen. *I.R.E., Proceedings*, v. 45, Aug. 1957, p. 1069-1080.

Calculations aimed at establishing a useful picture of ion oscillations in gridded drift tubes are presented, and a plausible physical picture of some possible ion motions is obtained.

16181 Polarization Reversal and Switching in Guanidinium Aluminum Sulfate Hexahydrate Single Crystals. Harry H. Wieder. *I.R.E., Proceedings*, v. 45, Aug. 1957, p. 1094-1099.

The ferroelectric switching properties of GASH $(CN_3H_6)\cdot Al(SO_4)_2\cdot 6H_2O$ were studied under sinewave and pulse conditions. The results indicate that the polarization reversal process is analogous to that found in barium titanate single crystals.

16182 Straight-Field Permanent Magnets of Minimum Weight for TWT Focusing—Design and Graphic Acids in Design. Myron S. Glass. *I.R.E., Proceedings*, v. 45, Aug. 1957, p. 1100-1105.

A convenient design formula has been derived which enables one to estimate readily the minimum amount of magnetic material which will satisfy a given set of field strength requirements on the axis of a tubular permanent magnet.

16183 Heat Loss in Grooved Metallic Surface. Enrique A. Marcatili. *I.R.E., Proceedings*, v. 45, Aug. 1957, p. 1134-1139.

An elementary and powerful way to calculate the conduction current losses in metallic waveguide walls.

16184 Arc Suppression for Relay Contacts in DC Service. William J. Godsey. *Institute of Radio Engineers, Transactions on Component Parts*, v. CP-4, June 1957, p. 36-42. (TK1 In6.6cp Contin.)

Components of reasonable size can be used with small vibration-resistant relays to control large direct currents at high potentials.

16185 Evaluation of Transistor Life Data. J. D. Johnson and B. VanSwearingen. *Institute of Radio Engineers, Transactions on Reliability and Quality Control*, PGRQC-11, Aug. 1957, p. 15-26. (TK1 In6.6g Contin.)

Components are initially evaluated at different temperatures to determine such general characteristics as current gain and leakage currents in the collector and emitter cutoff region. The use of calculators accelerates the evaluation period and therefore allows more data to be analyzed efficiently. This method permits either individual or group evaluation procedures. The results are presented on curves and charts.

16186 On the Measurement of Component Reliability. I. K. Munson. *Institute of Radio Engineers, Transactions on Reliability and Quality Control*, PGRQC-11, Aug. 1957, p. 27-33. (TK1 In6.6g Contin.)

The use of accelerated testing as a means of measuring component failure.

16187 In-Process Controls to Maximize Capacitor Reliability. H. S. Herrick. *Institute of Radio Engineers, Transactions on Reliability and Quality Control*, PGRQC-11, Aug. 1957, p. 34-53. (TK1 In6.6g Contin.)

The procedures used by one company to improve reliability of a product.

16188 Method for the Determination of Reliability. K. E. Portz and H. R. Smith. *Institute of Radio Engineers, Transactions on Reliability and Quality Control*, PGRQC-11, Aug. 1957, p. 65-73. (TK1 In6.6g Contin.)

16189* A Simple Transformer Bridge for the Measurement of Transistor Characteristics. W. F. Lovering and D. B. Britten. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, no. 16, July 1957, p. 368-373.

16190* The Capacitance Between Diode Electrodes in the Presence of Space Charges. C. S. Bull. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, no. 16, July 1957, p. 374-378.

16191* A Study of High-Speed Avalanche Transistors. J. R. A. Beale, W. L. Stephenson, and E. Wolfendale. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, no. 16, July 1957, p. 394-402.

Static and dynamic properties, design, and application of junction transistors displaying an extremely fast relaxation oscillation.

16192* Propagation of the Circular H_{01} Low-Loss Wave Mode Around Bends in Tubular Metal Waveguide. H. E. M. Barlow. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, no. 16, July 1957, p. 403-409.

16193* The Magnetic Cell: A New Circuit-Element. D. S. Ridler and R. Grimmond. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, Suppl. no. 7, 1957, p. 445-456.

Properties of the circuit element formed by a wire passing through a hole in a block of rectangular-hysteresis-loop ferrite. This element is considered in relation to a small core of the same material, first as a storage element and secondly as a gating element.

16194 An Introduction to Semiconductors. W. Crawford Dunlap, Jr. 417 p. 1957. John Wiley & Sons, New York. (QC611 D92i)

Basic concepts, properties of materials, methods of measurement, and applications.

16195 IRE National Convention Record, 1957. Pt. 1-10. Individually paged. (TK1 In6.6lc Vis.)

Antennas and propagation; microwaves; circuit theory; information theory; broadcast and TV receivers; electron devices; automatic control; computers; medical electronics; instrumentation; telemetry and remote control; components; industrial electronics; production; audio; broadcast transmission systems; aeronautical and navigational electronics; communications sys-

tems; military electronics; vehicular communications; nuclear science; ultrasonics; engineering management; reliability and quality control.

16196* Transistorizing a Power Supply for Telemeters. O. J. Cooper. *ISA Journal*, v. 4, Aug. 1957, p. 318-321.

A thorough discussion of the design problems to be solved in producing a small, light-weight transistorized power supply.

16197 Minority Carrier Lifetime in *p-n* Junction Devices. M. Byczkowski and J. R. Madigan. *Journal of Applied Physics*, v. 28, Aug. 1957, p. 878-881.

A relation between minority carrier lifetime and recovery time has been obtained for *p-n* junction rectifiers of arbitrary base width. The recovery time is a function of both the lifetime and the transit time. Recovery time measurements on diffused junction Si rectifiers as a function of base width were found to be in satisfactory agreement with the theory.

16198* Perturbation Analysis of Stationary Dense Electron Flow and a Space-Charge-Limited Triode. G. A. Stuart and B. Meltzer. *Journal of Electronics and Control*, v. 3, July 1957, p. 51-62.

16199* Space Charge Neutralization by Ions in Linear Flow Electron Beams. N. C. Barford. *Journal of Electronics and Control*, v. 3, July 1957, p. 63-86.

The integro-differential equation of linear electron space charge flow in the presence of ions is obtained, using an empirical formula for the cross-section for ion production by electrons based on experimental results. Two examples are given of the numerical application of the theory to problems of practical importance.

16200* (French.) Method of Calculating the Energy Levels of Deep Traps in a Semiconducting Crystal. **Méthode de calcul des niveaux énergétiques associés aux pièges profonds d'un cristal semiconducteur.** Jacques des Cloizeaux and Pierre André. *Journal de Physique et le Radium*, v. 18, July 1957, p. 441-446.

If the effective masses for the valence and conduction bands and also the gap between these bands are known, it is possible to estimate the energy spectrum. These results can be used for the calculation of the energy levels of deep lying traps.

16201 Printed Circuitry. IV. Components. Allan Lytel. *Military Automation*, v. 1, July-Aug. 1957, p. 210-216.

(To be continued.)

16202* (German.) A New Method for Analyzing Synchronous Tuning in Superheterodyne Receiving Sets. **Eine neue Methode der Gleichlaufabstimmungsanalyse in Überlagerungsempfängern.** J. Holownia. *Nachrichtentechnik*, v. 7, July 1957, p. 289-293.

Basic formulas of the new method. Effect of the padding on the tuning of the oscillatory circuit. Synchronism in a graphic form. Examples of synchronous analysis.

16203* (German.) The Effect of Solar Ultra-Radiation on Radio Propagation on 23 February, 1956. **Über den Einfluss der Solaren Ultrastrahlung auf die Funkwetterlage am 23. Februar 1956.** B. Beckmann, P. Dietrich, and H. Salow. *NTZ; Nachrichtentechnische Zeitschrift*, v. 10, July 1957, p. 329-334.

Reports on the ionizing influence of solar ultraradiation in the ionosphere during and after strong solar eruptions.

16204* (English.) **Transmitters for Television & FM Broadcasting.** P. W. L. van Iterson and H. A. Teunissen. *Philips Telecommunication Review*, v. 18, June 1957, p. 19-30.

A range of television and F.M. sound broadcasting transmitters covering the internationally agreed frequency bands I, II, and III.

16205* (English.) **Some Experiments on the Surface Field Effects in Germanium Single Crystals.** Makoto Kikuchi. *Physical Society of Japan, Journal*, v. 12, July 1957, p. 756-762.

From combined measurements of the field effect on the surface conductance and on the surface recombination velocity, it was found that ψ_s (the difference between the Fermi level and the middle of the energy gap at the surface) drifts towards a negative value when the surface is kept in room air after being submitted to CP-4 etching. This drift is accompanied by a gradual growth of oxide layer on the surface.

16206 Dispersion Effects in Ultrasonic Waveguides and Their Importance in the Measurement of Attenuation. M. Redwood. *Physical Society, Proceedings*, v. 70, no. 452B, Aug. 1957, p. 721-737.

The analysis is extended to solid waveguides, where reflections at the walls of the guide produce a partial conversion to transverse waves. The practical effect of this on mode interference is discussed, and the final results of the analysis are compared with experiment. The estimated errors in the measurement of attenuation are tabulated for several frequencies and compared with the intrinsic absorption in fused silica and single-crystal Ge.

16207 Simple Power-Transistor Test. William C. Caldwell. *Radio-Electronics*, v. 28, Sept. 1957, p. 51-52.

The use of an ohmmeter to check gain and leakage.

16208* (Russian.) High-Frequency Waves in a Coaxial Cable. **Bystrye volny v koaksial'noi spiral'noi linii.** L. H. Loshakov and E. B. Ol'derogge. *Radiotekhnika*, v. 12, June 1957, p. 25-30.

Theoretical investigation of the spreading of different types of H.F. waves in a coaxial cable.

16209* (Russian.) The Analysis of Transition Processes During Diode Detection by the Method of Low-Frequency Equivalents. **Analiz perekhodnykh protsessov pri diodnom detektirovanii metodom nizkochastotnykh ekvivalentov.** L. S. Gutkin and O. S. Chentsova. *Radiotekhnika*, v. 12, June 1957, p. 31-44.

Description of the method of analysis of transition processes in the system: high-frequency amplifier-diode detector.

16210* (English.) **Siemens Junction Transistors.** Heinz Henker. *Siemens Review*, v. 24, Apr. 1957, p. 67-74.

Three *npn* junction transistors designated TF 70, TF 71, and TF 72 which differ from each other mainly with respect to the value of their current amplification factor.

16211* (German.) Electronics in Long Distance Dialing. **Elektronik in der Landesfernwahl.** Hans-Joachim Lurk and Friedrich Rings. *Siemens Zeitschrift*, v. 31, no. 3, Apr. 1957, p. 101-106.

Construction and operation of electronic converters for routing and accounting by zone in long distance dialing systems.

16212* (German.) Siemens Disc Triodes for Microwave Technology. **Siemens-Scheibentrioden für die Mikrowellentechnik.** Helmuth Kaunzinger. *Siemens Zeitschrift*, v. 31, no. 3, Apr. 1957, p. 114-117.

Characteristics, data, applications, and examples.

16213* (German.) The Point Rectifier, a New Selenium Miniature Rectifier. **Der Punktgleichrichter, ein neuer Selen-Kleinstgleichrichter.** Robert D. Murmann. *Siemens Zeitschrift*, v. 31, no. 4, Apr. 1957, p. 190-191.

Construction, electric characteristics, and possible uses.

16214* (German.) The New Siemens High Performance Selenium Rectifier. **Der neue Siemens-Hochleistungs-Selengleichrichter.** Karl Seethaler. *Siemens Zeitschrift*, v. 31, no. 4, Apr. 1957, p. 227-230.

Features smaller voltage drop, higher permissible operating temperature, and practically no aging.

16215 Table of (Sin X) /X. George E. Reynolds. *U. S. Air Force, Cambridge Research Center*, AFCRS-TR-57-103, May 1957. Not paged. (TK7800 Un3.12B Contin.)

Mathematical tables for use in antenna design.

16216* (German.) Background Noise From Germanium Monocrystals. **Über das Rauschen von Germanium-Einkristallen.** D. Sautter and K. Seiler. *Zeitschrift für Naturforschung*, v. 12a, June 1957, p. 490-497.

Background noise measured in relation to strength of field, temperature, frequency, and setting (junction placement).

See also: **15578** (multiple-track tape recorder); **15929** (temperature and microwave dispersion in mono-substituted benzenes); **16096** (null instrument for measuring small a.c.); **16289** (interaction of electromagnetic waves in an ionized gas); **16292** (atmospheric

radio wave propagation); **16293** (tropospheric scatter propagation); **16391** (Ge photodiodes); **16891** (human engineering in electronics); **16923** (tolerances of filter quartzes); **16969** (phonograph record testing); **17070** (dip-soldering of printed circuit boards); **17093** (measurement of distance by microwaves).

ENGINEERING ECONOMICS

16217 European Free Trade Area. 86 p. 1957. Federation of British Industries, London. (HB1713 F31e)

A survey of the background and general economic problems needed to be overcome in establishing this union.

16218 Europe To-Day and in 1960. v. I. Europe To-Day. v. II. Europe in 1960. 8th Annual Report of the O.E.E.C. 120 and 152 pages. 1957. Organisation for European Economic Co-Operation, Paris. (HC240 Or3a)

A report of the economic situation in Western Europe with a forecast for the next four years.

16219 Needed—Integrated Cost Reduction. *Factory Management and Maintenance*, v. 115, Aug. 1957, p. 83-126.

Presentation of ten articles on cost reduction methods.

16220* Engineering—America's Most Critical Resource. J. M. MacBrayne. *Journal of Industrial Engineering*, v. 8, July-Aug. 1957, p. 221-223.

Discusses the problem of lack of engineering graduates from American colleges.

16221 World Copper Resources. H. J. Miller. *Metal Industry*, v. 91, July 19, 1957, p. 49-50.

Deposits in the U. S. and Northern Rhodesia are studied. (To be continued.)

16222 Soviet Economic Growth: A Comparison With the United States. 149 p. 1957. United States Government Printing Office, Washington, D. C. (HC335 Un3.4s)

16223 *United Nations Monthly Bulletin of Statistics*, v. 11, Aug. 1957, 189 p.

Statistical data on population, manpower, manufacturing, trade, wages and prices, national income, and finance of countries of the world. Special article on working population of the world and its geographic and sex distribution.

See also: **16298** (resources of West Virginia); **16307** (Ohio hydrologic data); **16837** (power reactor fuel reprocessing).

FLUID MECHANICS

16224 On the Adiabatic Couette Flow of a Compressible Fluid. W. F. Hughes and J. F. Osterle. *ASME, Transactions*, v. 79, Aug. 1957, p. 1313-1316.

Investigation of the adiabatic flow of air between two parallel plates very close together in relative tangential motion with a pressure differential across the moving plate.

16225 Control Valves: A Guide to Their Selection and Use. Chester S. Beard. *Automatic Control*, v. 7, Aug. 1957, p. 18-23.

Describes the application characteristics of various types of control valves.

16226* Flow Measuring Devices. Key to Process Control. J. J. Combes and M. J. De Pasquale. *Automation*, v. 4, Sept. 1957, p. 47-60.

The various devices for flow measurement, their operating principles, advantages, disadvantages, and applications.

16227* Potential and Stream Function of a Vortex Disk in the Presence of a Rigid Sphere. J. Martinek, G. C. K. Yeh, and H. Zorn. *Cambridge Philosophical Society, Proceedings*, v. 53, July 1957, p. 717-727.

Determination of the image system and evaluation of the disturbance potential.

16228 Mass Transfer Through Compressible Turbulent Boundary Layers. T. K. Sherwood and H. S. Bryant, Jr. *Canadian Journal of Chemical Engineering*, v. 35, Aug. 1957, p. 51-57.

New data are presented on mass transfer to air at velocities up to 520 m. per sec. (Mach 2.02). These were obtained by measuring the rate of sublimation of naphthalene, thymol, and camphor from cylinders placed longitudinally in air streams in three subsonic and supersonic ducts. The results lend semi-quantitative support to the conclusion that the effect of Mach number is the same for mass transfer and for skin friction.

16229 Correlations in Fixed Bed Systems. Max Leva. *Chemical Engineering*, v. 64, Sept. 1957, p. 245-248.

How to predict pressure drop by means of a Kozeny-Carman type equation; how to handle pressure drop when compressible fluids flow through reactor beds; step-by-step analysis enables calculation of power requirements for fluid circulation.

16230* (French.) The Problem of Kinetic Heating. **Le problème de l'échauffement cinétique.** G. Lehr. *DOCAERO; Revue Documentaire de la Technique Aéronautique Mondiale*, 1957, no. 45, July, p. 3-20.

Basis for the calculation of kinetic heating. Flat-plate. Turbulent flow. Recuperation, friction, and Reynolds analogy coefficients. Boundary layer control and transition. Application to intercontinental airplanes.

16231* (French.) A Contribution to the Partial Deflection of a Jet. **Contribution a la déviation partielle d'un jet.** G. Ernst. *DOCAERO; Revue Documentaire de la Technique Aéronautique Mondiale*, 1957, no. 45, July, p. 29-34.

The effect and efficiency of a "spoiler" or an auxiliary jet used for the deflection and contraction of the main jet. Only a plane and incompressible flow was considered.

16232* (Russian.) Aerodynamics of Air Blasts Flowing From Nozzles With Differently Shaped Outlets. **Aerodinamika strui razlichnoi formy ust'ia.** Iu. V. Ivanov. *Eesti NSV Teaduste Akadeemia, Toimetised. Tehniliste ja Füüsikalis-Matemaatiliste Teaduste Seeria*, v. 6, no. 2, 1957, p. 131-144.

Results of tests carried out with rectangular or circular blasts for study of mixing processes in flue gases show that in the case of equivalent diameters the mixing effect of the blasts is identical.

16233* (Russian.) Hydrodynamic Resistance in the Transonic Flow Range. **O gidrodinamicheskom soprotivlenii v transzvukovoi oblasti techeniia.** A. A. Gukhman, A. F. Gandel'sman, and L. N. Naurits. *Energomashinostroenie*, 1957, no. 7, July, p. 10-14.

Calculations for transonic flow in channels. Possible applications of the method.

16234 Performance Characteristics of a 48 Inch Water Tunnel. Flow Improvements With a Honeycomb. J. M. Robertson and D. Ross. *Engineering*, v. 184, July 19, 1957, p. 76-80.

16235* Fluid Mechanics. II. Fluid Statics and Kinematics. James M. Robertson. *Industry Power*, v. 73, Sept. 1957, p. 22 + 5 pages.

Reviews basic principles and formulas.

16236* Three-Dimensional Motion in Axial-Flow Impellers. S. P. Hutton. *Institution of Mechanical Engineers, Proceedings*, v. 170, no. 25, 1956, p. 863-873.

Detailed surveys were made of the flow through a low-pressure-rise axial-flow impeller (hub/tip diameter ratio 0.33) which did not produce "free vortex" whirl distribution.

16237* Effect on the Local Heat-Transfer Coefficient in a Pipe of an Abrupt Disturbance of the Fluid Flow: Abrupt Convergence and Divergence of Diameter Ratio 2/1. A. J. Ede, C. I. Hislop, and R. Morris. *Institution of Mechanical Engineers, Proceedings*, v. 170, no. 38, 1956, p. 1113-1130.

The effect of an abrupt divergence, diameter ratio 1/2, was determined for Reynolds numbers from 3,700 to 45,000 in a 2-inch pipe. The variation in local coefficient was considerable.

16238* (Russian.) Flow of Theoretical Gas Around Bodies During Hypersonic Speed. **Obtekanie tel ideal'nym gazom pri bol'shoi sverkhzvukovoi skorosti.** G. G. Chernyi. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk*, 1957, no. 6, June, p. 77-85.

An analytical method for the calculation of the flow of an ideal gas around bodies having symmetrical axes and flat contours. Solution of basic equations of gas dynamics. Application to the flow around a spinning body in the form of a truncated cone.

16239 Investigation of the Factors Affecting the Attachment of a Liquid Film to a Solid Surface. C. F. Warner and B. A. Reese. *Jet Propulsion*, v. 27, Aug. 1957, p. 877-881.

Effects of liquid injection velocity, gas velocity, slot geometry, liquid physical properties, and gas density upon the film attachment are examined experimentally.

16240 Energy Exchange in Shock Waves. Donald F. Hornig. *Journal of Physical Chemistry*, v. 61, July 1957, p. 856-860.

Shock waves have become important in the study of intermolecular energy exchange because they provide a convenient source of high temperatures and also afford a means of changing temperature and flow velocity in gases at a rate which is comparable to or faster than the energy exchange processes.

16241 A Bolometer Detector for the Measurement of Shock Velocity in Low Density Gases. J. G. Clouston, L. J. Drummond, and W. F. Hunter. *Journal of Scientific Instruments*, v. 34, Aug. 1957, p. 321-324.

Shock waves were generated in a shock tube consisting of a high pressure chamber (mild steel) separated by cello-plane diaphragms from a low pressure expansion channel. Several materials were tested as non-conducting media to hold and separate the electrodes across which a Au junction was made.

16242 Pressure-Temperature Relation for Constant-Area Compressible Flow of a Gas, Considering Heat Transfer and Friction With Constant Wall Temperatures. Franklin P. Durham. *Los Alamos Scientific Laboratory (U. S. Atomic Energy Commission)*, LA-2129, July 1957, 81 p. (UF767 U3La Contin.)

The relation is independent of flow length and the absolute value of either the friction or heat transfer coefficients. The results of a machine computation are presented in a series of graphs that are useful for rapid estimation of pressure drop in terms of temperature rise and inlet flow conditions.

16243 Vortex-Velocity Type Flowmeter. J. Constant van Rijn and Bohumir Larys. *Petroleum Engineer (Management Ed.)*, v. 29, Aug. 1957, p. D27-D30.

New meter is a direct integrating device in which the gross volume flow is instantaneously obtained from counter with only a single correction needed for net volume.

16244* Effect of Pipe Roughness on Fluid Meter Discharge Coefficient. Stanley Abramovitz. *Power*, v. 101, Aug. 1957, p. 75-77.

Tests showed a significant increase in discharge coefficient caused by pipe roughness.

16245 Friction in Pipes—A Wide-Range Nomograph. Reagan Houston. *Product Engineering*, v. 28, Aug. 1957, p. 191-193.

16246 (French.) A Contribution to the Study of Forced Thermal Convection on Rough Walls. **Contribution a l'étude de la convection forcée de la chaleur sur des parois rugueuses.** Giovanni Brunello. *Publications Scientifiques et Techniques du Ministère de l'Air*, 1957, no. 332, 75 p. (TL502 F84.1p Vis.)

A study, by the classical method, of convection on heated rough cylinders normally exposed to an air flow. Shows a new method measuring the heat exchange between a wall and a moving fluid and considers thermal convection and friction on plane rough plates.

16247 (French.) Theoretical and Experimental Research on the Motions of Heavy Liquids With a Free Surface. **Recherches théoriques et expérimentales sur les mouvements des liquides pesants avec surface libre.** Achyut S. Apté. *Publications Scientifiques et Techniques du Ministère de l'Air*, 1957, no. 333, 115 p. (TL502 F84.1p Vis.)

A theoretical study of the limit pattern of the solitary wave. Theory concerning the production of the swell harmonics by means of a three bar beater. Calculation of tidal waves caused by a plane swell in a rectangular harbor.

16248* Experiments on the Slow Swirling Flow of a Viscous Liquid Through a Tube. A. M. Binnie. *Quarterly Journal of Mechanics and Applied Mathematics*, v. 10, Aug. 1957, p. 276-290.

For four different arrangements of blockage in the two fixed lengths of tube, the results are plotted on diagrams having for their axes two dimensionless quantities that depend respectively on the tangential velocity at admission and on the mean axial velocity through the tube.

16249* The Flow of Fluid Along Cylinders. J. C. Cooke. *Quarterly Journal of Mechanics and Applied Mathematics*, v. 10, Aug. 1957, p. 312-321.

Explicit calculations are made of the drag of an elliptic cylinder of eccentricity $\frac{1}{2}\sqrt{3}$. There is evidence that the drag is everywhere less than that of a circular cylinder of the same perimeter.

16250 The Hydrodynamic Stability of Helium II Between Rotating Cylinders. I-II. S. Chandrasekhar and R. J. Donnelly. *Royal Society, Proceedings*, v. 241, ser. A, July 23, 1957, p. 9-36.

16251* (Russian.) Hydraulic Resistance of Welded, Sharply Bent, and Wrinkled Elbows. **O gidravlicheskom soprotivlenii svarnykh, krutozagnutykh i skladchatykh kolen.** A. G. Kamershtein. *Stroitelstvo Predpriiatii Neftianoi Promyshlennosti*, v. 2, June 1957, p. 9-11.

The coefficients of hydraulic resistance of various types of elbows in relation to their diameter and curvature are shown in graphs.

16252 Experimental Investigation of Attenuation of Strong Shock Waves in a Shock Tube With Hydrogen and Helium as Driver Gases. Jim J. Jones. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4072, July 1957, 24 p. (TL570 Un3t)

Time-history measurements were made of the static pressure at several stations in the wall of the tube. A helium-driven shock wave was found to decay only about one-half as rapidly as a hydrogen-driven shock wave.

16253 Pressure Probes at Very Low Density. K. R. Enkenhus. *University of Toronto, Institute of Aerophysics, UTIA Report No.* 43, Jan. 1957, 158 p. + 11 plates.

Experimental tests of conventional impact probes and a new type of probe, called an orifice probe, were made in the transition flow regime and in free molecule flow. The data may be applied to relate pressure readings to the free stream Mach number when calibrating rarefied gas streams. Effects on pressure readings of such factors as outgassing, thermal transpiration, orifice geometry, etc., were investigated in detail.

16254 An Experimental Investigation of Laminar Boundary Layer Profiles in a Weak Adverse Pressure Gradient at an Incident Mach Number of Three. E. A. Racicot. *University of Toronto, Institute of Aerophysics, UTIA Report No.* 46, Mar. 1957, 34 p. (TL570 T64.84a Vis.)

Experimental pitot pressure profiles through a laminar boundary layer in supersonic flow and under a weak adverse pressure gradient. Some information is presented about the effects of probe geometry on the shape of the measured profile.

16255 The Development of a Mass Flow Probe. E. R. Wolff. *University of Toronto, Institute of Aerophysics, UTIA Technical Note No.* 12, Jan. 1957, 55 p. (TL570 T64.84t Vis.)

Determines all of the flow quantities in a supersonic free-stream or boundary layer, using the measured mass flow as one of the independent parameters.

16256 Interaction of a Shock Wave With a Wire Screen. W. J. Franks. *University of Toronto, Institute of Aerophysics, UTIA Technical Note No.* 13, May 1957, 40 p. (TL570 T64.84t Vis.)

Two screens of 8 mesh, 50% blockage, and 30 mesh, 62% blockage, were used with incident shock pressure ratios up to 12. Calculated transmitted and reflected shock strengths and choking Mach numbers on the basis of these models are in good agreement with the experimental results.

See also: **15576** (luminscent gas flow visualization); **15577** (Hilbert problem of an airfoil in unsteady flow); **15579** (interferometry in wind tunnels); **15581** (laminar compressible boundary layer of a flat plate); **16312** (flow of petroleum reservoir fluids); **16410** (viscosity/temperature relationship in oils); **16429** (performance of an axial-flow pump); **16940** (magneto gas dynamics); **16979** (turbulence in molding polyethylene); **17026** (flow characteristics of multiple leaf dampers).

FOOD TECHNOLOGY

16257 Chemical Additives in Food. II. *Chemical Age*, v. 78, Aug. 10, 1957, p. 209-210.

Public health and practical aspects of antibiotic usage.

16258 Anti-Caking Agents—How Evaluated, How Applied. *Food Engineering*, v. 29, Aug. 1957, p. 85-86.

Methods of evaluation and application.

16259 Why Not Try Titanium? H. B. Bomberger, G. T. Bedford, and R. M. Lorz. *Food Engineering*, v. 29, Aug. 1957, p. 97 + 2 pages.

The use of Ti in the food industry to solve corrosion problems. List of corrosive agents given.

16260* Film Packaging of Heat Processed Orange Juice Products. I. Some Factors Affecting Stability of the Product. II. Storage Study. H. C. Mannheim, A. I. Nelson, and M. P. Steinberg. *Food Technology*, v. 11, Aug. 1957, p. 417-426.

16261* Antibiotics in Poultry Meat Preservation. A Comparison of the Tetracyclines. Reese H. Vaughn, Charles W. Nagel, F. Miles Sawyer, and George F. Stewart. *Food Technology*, v. 11, Aug. 1957, p. 426-429.

Comparison was made of the effectiveness of three tetracycline antibiotics for improving the storage life of chilled poultry.

16262 The Freezing Preservation of Foods. v. II. Freezing of Precooked and Prepared Foods. Donald K. Tressler and Clifford F. Evers. 3rd Rev. Ed. 559 p. 1957. AVI Publishing Co., Westport, Conn. (TP493 T72f3)

16263 Production of Carbonyl Compounds During Irradiation of Meat and Meat Fats. O. F. Batzer, M. Sribney, D. M. Doty, and B. S. Schweigert. *Journal of Agricultural and Food Chemistry*, v. 5, Sept. 1957, p. 700-703.

Carbonyl compounds increase in both meat and fat with increasing irradiation dosages.

16264* The Non-Essentiality of Fluorine in Nutrition. Richard L. Maurer and Harry G. Day. *Journal of Nutrition*, v. 62, Aug. 1957, p. 561-573.

Demonstrates that under the rigorous experimental conditions employed, fluorine is not a dietary essential. Thus its value in the body is apparently limited to the promotion of resistance to dental caries.

16265 Food Perishability: The Determination of the Vulnerability of Food Surfaces to Bacterial Infection. D. H. F. Clayson and Ruth M. Blood. *Journal of the Science of Food and Agriculture*, v. 8, July 1957, p. 404-414.

16266 A Food Sterilization Reactor. E. O. Guernsey, et al. *Oak Ridge School of Reactor Technology (U. S. Atomic Energy Commission)*, CF-55-8-190, Aug. 1955, 156 p. (UF767 Un3.1cf Contin.)

A study was made to determine the feasibility of sterilizing beef with reactor produced γ radiation. A conceptual design for a reactor-irradiation system, involving activation of medium in the blanket of a heterogeneous reactor.

See also: **17028** (heat and vapor in refrigerated packaged goods).

FUELS AND COMBUSTION

16267 Study of Structural Changes of Heated Coal. M. O. Holowaty. *Blast Furnace and Steel Plant*, v. 45, Aug. 1957, p. 879 + 11 pages.

The behavior of bituminous coals heated without load is strongly affected by the position of the coal samples relative to the plane of the heating surface. The behavior of individual coals in load heating tests can be fairly well predicted from the Gieseler plasticity index. The ability of the bituminous coals to withstand mechanical pressures is better when they are applied in the direction of the petrographical layers than when applied perpendicularly to them.

16268 Servomechanisms in Combustion Control. John S. Tyndall. *Combustion*, v. 29, Aug. 1957, p. 45-54.

The application of instrumentation to power plant controls to improve fuel efficiency, insure safe and reliable operations, and to utilize operating personnel efficiently.

16269 Combustion Researches and Reviews, 1957. 204 p. 1957. Butterworths Scientific Publications, London. (QD516 C73r)

A compilation of 10 papers on combustion by AGARD Combustion and Propulsion Panel.

16270* (Russian.) Halogen Treatment of Coals Under the Action of Ultrasonic Waves. **O protsesse galoidirovaniia uglei pod deistviem ul'trazvukovykh voln.** B. I. Losev, I. E. El'piner, and A. N. Mel'nikova. *Doklady Akademii Nauk SSSR*, v. 114, May 11, 1957, p. 372-374.

Bromination and chlorination of long-flame coal under the action of ultrasonic waves. Wave intensity was relatively low, yet the reaction with coal was accelerated in liquid Br and gaseous Cl.

16271 Hydrogen Cyanide-Fluorine-Oxygen Flame. Charles S. Stokes and A. V. Grosse, Jr. *Industrial and Engineering Chemistry*, v. 49, Aug. 1957, p. 1311-1314.

Dual gas streams burned in a diffusion torch produce the highest temperatures (above 4000 K) that can be achieved with commercially available materials.

16272* The Shatter Strength of Cokes From High-Volatile Coals: Use of Plastometer Measurements on Blends for Test-Oven Experiments. D. W. Gillings and W. Lawson. *Institute of Fuel, Journal*, v. 30, Aug. 1957, p. 446-460.

16273 Fundamentals of Combustion of Gaseous Fuels. S. A. Weil, R. T. Ellington, E. F. Searight, and S. Hu. *Institute of Gas Technology Research Bulletin* 15, Apr. 1957, 63 p. (TP700 In7r Contin.)

A review of the literature through August 1955 on the theory of combustion, combustion phenomena, experimental investigations of various phases of combustion, and certain fundamentals important to burner design.

16274 The Combustion of Gas Mixtures Containing Hydrogen Cyanide. L. Cohen and P. Simpson. *Journal of Applied Chemistry*, v. 7, July 1957, p. 413-418.

In no case was the combustion found to be complete. Some possible reaction schemes are suggested.

16275* (Russian.) Comparative Evaluation of Metallurgical Coke Test Methods. **Sravnitel'naia otsenka metodov ispytaniia metallurgicheskogo koksa.** K. I. Syskov and G. I. Enik. *Koks i Khimiia*, 1957, no. 7, p. 26-30.

Describes various methods and their results in regard to coke quality. Effect of modification of the charge type, of grinding and ramming of the charge, of coking chamber width, and of heating process on quality of the coke.

16276* (German.) Combustion and Gasification of Heavy Liquid Fuels in a Cyclone Chamber. **Verbrennung und Vergasung schwerer flüssiger Kraftstoffe in einer Wirbelkammer.** H. A. Havemann and K. Mahadevan. *MTZ: Motortechnische Zeitschrift*, v. 18, July 1957, p. 208-214.

Design, construction and experimental operation of a small cyclone chamber in which Diesel and bunker oils are burnt and also gasified.

16277* (Czech.) Selective and Petrographic Coal Preparation for Coke Production. **Selektivní a petrografická příprava uhlí pro výrobu koksu.** V. Kudela. *Paliva*, v. 37, July 1957, p. 221-225.

Importance of coal grain size on coke quality. Principles of Sovaco method; types of Sovaco processes.

16278* (Czech.) Effect of Operating Conditions on Phenol Concentration in Carbonization Waters. **Vliv provozních podmínek na koncentraci fenolů v karbonisačních vodách koksoven.** M. Sedlák. *Paliva*, v. 37, July 1957, p. 231-233.

Operating conditions are very important in obtaining waste water with a high phenol concentration. The influence of several operating factors, especially thermal conditions in chambers, on the phenol content of carbonization water is emphasized. Two tables show phenol content in ammonia water in Czech coke by-product plants.

16279 Petrography of American Coals. B. C. Parks and H. J. O'Donnell. *U. S. Bureau of Mines Bulletin* 550, 1956, 193 p. (TN21 Un3b)

Tabulated data of 217 samples of various American coals.

16280 Drop Burning Rates of Hydrocarbon and Non-hydrocarbon Fuels. Arthur L. Smith and Charles C. Graves. *U. S. National Advisory Committee for Aeronautics, Research Memorandum*, RM E57F11, Aug. 1957, 22 p. (TL782 Un3rm Vis.)

The drop burning rates were proportional to the drop diameter. Drop burning rates of the 15 fuels varied from 0.0086 to 0.0141 $cm.^2$ per sec. for methanol and butylsilane. The variation in drop burning rates of the fuels considered did not correlate with the changes in combustion efficiency of a turbojet combustor.

16281* (English.) **Studies of the Mechanism of Flame Propagation in Premixed Gases.** J. H. Burgoyne and F. J. Weinberg. *Zeitschrift für Elektrochemie*, v. 61, no. 5, 1957, p. 565-569.

The steady-state equations for the conservation of mass, energy, and chemical species through an infinite plane flame front are set down and their complete solution discussed. A practicable approach to the problem can be based upon simultaneous measurements of burning velocity with temperature and/or species concentration distributions through the flame-front.

16282* (English.) **The Light Emission of Halogen Flames.** Robert F. Simmons and Hans G. Wolfhard. *Zeitschrift für Elektrochemie*, v. 61, no. 5, 1957, p. 601-609.

The radiation of flames supported by halogens as oxidizers was studied. Chlorine trifluoride, F, and Cl, give rise to flames whose structure and light emission are very different from those found in O flames. Bromine and methyl bromide were also added to O and air flames and their effect recorded.

16283* (Russian.) A Graphical Method for Determining the Combustion Temperatures of Organic Compounds. **Graficheskii metod opredeleniia temperatur sgoraniia organicheskikh soedinenii.** P. G. Maslov. *Zhurnal Fizicheskoi Khimii*, v. 31, May 1957, p. 1063-1071.

Method is applicable to the gaseous, liquid, and solid phases of pure compounds and their mixtures on giving the latter conditional chemical formulas. It is based on the additivity of the left and right sides of the energy balance equation of the reaction products with respect to the chain unit, in particular CH_2 groups.

See also: **15694** (coal and chemical engineering); **15960** (alkali metals in hydrogen flames); **16232** (mixing of flue gases); **16330** (liquid rocket propellants); **16336** (aerodynamics of combustion chambers).

GEOLOGY, GEOPHYSICS, MINERALOGY, AND MINING ENGINEERING

16284 Magnetic Interaction Between Ferromagnetic Minerals Contained in Rocks. T. Nagata, S. Uyeda, and M. Ozima. *Advances in Physics*, v. 6, July 1957, p. 264-287.

Effect of heat treatment on the thermo-remanent magnetism of ferromagnetic ilmenites; interpretation of the results; thermal change of coercive force.

16285* Velocity Logging and Its Geological and Geophysical Applications. H. R. Breck, S. W. Schoellhorn, and R. B. Baum. *American Association of Petroleum Geologists, Bulletin*, v. 41, Aug. 1957, p. 1667-1682.

The velocity measurements in the borehole are obtained over short intervals from the travel time of pulsed sound waves through the sidewall. This measurement is a function of the elastic coefficients of the formations logged and is affected principally by degree of compaction and geologic age.

16286* Development of Fracture Analysis as Exploration Method. P. H. Blanchet. *American Association of Petroleum Geologists, Bulletin*, v. 41, Aug. 1957, p. 1748-1759.

Fracture analysis is based on the premise that the earth's crust is systematically fractured and that this fracturing can be recognized and analyzed on aerial photographs. Four sets of fractures, arranged in two groups of two, the orientation of which is regionally systematic, have been found in all areas studied. The local deviations in the statistical mean direction of the fracture sets, when measured and analyzed, are found to be related to structure or stratigraphic anomalies.

16287 The System Water-Nepheline-Albite: A Theoretical Discussion. George W. Morey. *American Journal of Science*, v. 255, Summer 1957, p. 461-480.

A discussion of possible P-T curves and invariant points in the system.

16288 Differential Thermal Analysis of Sulfides and Arsenides. Otto C. Kopp and Paul F. Kerr. *American Mineralogist*, v. 42, July-Aug. 1957, p. 445-454.

Illustrative differential thermal curves of minerals containing S and As are shown, including pyrite, chalcopyrite, and arsenopyrite.

16289* (French.) Theory of the Interaction Between Two Electromagnetic Waves in an Ionized Gas. **Théorie de l'interaction entre deux ondes électromagnétiques dans un gaz ionisé.** Michel Bayet, Jean-Loup Delcroix, and Jean-François Denisse. *Annales des Télécommunications*, v. 12, May 1957, p. 140-141.

Calculation of the interaction phenomena occurring in the lower layers of the ionosphere. Application of the Boltzmann equation. Electron distribution. Interaction parameters calculated from the frequency of electron-molecule collisions.

16290* (French.) Current Problems of Ionospheric Forecasts. **Quelques problèmes actuels de la prévision ionosphérique.** Karl Rawer. *Annales des Télécommunications*, v. 12, May 1957, p. 169-172.

Forecast of propagation of decametric waves. Simplified patterns are introduced for the ionosphere and for propagation phenomena.

16291 Atmospheric Electricity. J. Alan Chalmers. 327 p. 1957. Pergamon Press, New York. (QC961 C35a)

A comprehensive treatise with a discussion of the most recent advances.

16292* Coupled Forms of the Differential Equations Governing Radio Propagation in the Ionosphere. II. K. G. Budden and P. C. Clemmow. *Cambridge Philosophical Society, Proceedings*, v. 53, July 1957, p. 669-682.

The physical significance of the equations is illustrated by considering the energy flux in one characteristic wave when coupling and damping are neglected.

16293 A New Technique for the Study of Scatter Propagation in the Troposphere. J. H. Chapman, W. J. Heikkila, and J. E. Hogarth. *Canadian Journal of Physics*, v. 35, Aug. 1957, p. 823-830.

Experiments at a carrier frequency of 500 Mc. have shown that the propagation noise power density usually varies with sideband frequency f as $1/f^2$, for f in the range 0.1 to 10 c.p.s. Departures from this law have been observed in the regions near 0.1 c.p.s. and 10 c.p.s.

16294 Discovery of the Universe. Gérard de Vaucouleurs. 328 p. 1957. Macmillan Co., New York. (QB15 V46d)

An outline of the history of astronomy.

16295 Elastic Waves in Layered Media. W. Maurice Ewing, Wenceslas S. Jardetzky, and Frank Press. 380 p. 1957. McGraw-Hill, New York. (QE534 Ew56e)

The methods and results of the theory of wave propagation in layered media are important in seismology, geophysical prospecting, and in many problems of acoustics and electromagnetism.

16296 Wire Telescope for Radio Astronomy. *Engineering*, v. 184, Aug. 9, 1957, p. 185-186.

Aperture synthesis technique simulates aerial 200,000 sq. ft. in area.

16297* Isotopic Composition of Common Leads and Continuous Differentiation of the Crust of the Earth From the Mantle. Royal R. Marshall. *Geochimica et Cosmochimica Acta*, v. 12, no. 3, 1957, p. 225-237.

U^{238}/Pb^{204} and Th^{232}/U^{235} ratios have been calculated from non-anomalous comomn leads. These values that would be present today in the reservoirs which produced the ores vary systematically with the "model" lead-lead age. The secular trend of the first ratio appears to be due to the addition of lead, primeval in isotopic composition, from the mantle to the crust of the earth.

16298 Geology and Economic Resources of the Ohio River Valley in West Virginia. Aureal T. Cross, Mart P. Schemel, Charles W. Carlston, and George D. Graeff, Jr. Pt. I, II, and III. v. XXII. 409 p. 1956. West Virginia Geological and Economic Survey, Morgantown. (QE177 W52.3w Vis.)

16299 The History of the Telescope. Henry C. King. 456 p. 1955. Sky Publishing Corp., Cambridge, Mass. (QB88 K58h)

A treatise of astronomy from Plato to the present.

16300* Recent Trends in Exploration Methods. A. T. Dennison and H. R. Warman. *Institute of Petroleum, Journal*, v. 43, July 1957, p. 187-197.

Suggests that the search for new and more obscure reserves of oil is pursued largely by refinements of earlier methods.

16301 Some Applications of Radioactivity in the Petroleum Industry. J. L. Putman. *Institue of Petroleum, Journal*, v. 43, Aug. 1957, p. 216-226.

16302 A New Technique for Examination of Oilfield Brines. W. P. Aycock, E. W. Hough, and George W. Crawford. *Journal of Petroleum Technology*, v. 9, Aug. 1957, p. 53-56.

Forty oilfield brines have been examined so far by a polarographic technique called the "tensammetric method". Graphs have been prepared of the data obtained in the testing of each sample, and the distinctive wave-like curves so obtained are characterized by reproducible profiles, called "response curves".

16303 An Evaluation of the Procedures Used in the Determination of the Grain Densities of Petroleum Reservoir Minerals. C. S. Brooks. *Journal of Petroleum Technology*, v. 9; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 210, Aug. 1957, p. 235-244.

Several of the commonly used methods for determination of effective grain densities of minerals were evaluated for accuracy and precision, and their applicability to various types of petroleum reservoir minerals tested. Consideration was given to the effect of consolidation, swelling clay, and wettability on these grain-density determinations.

16304 A Compressometer for Obtaining Stress-Strain Curves of Rock Specimens up to Fracture. E. R. Leeman and C. Grobbelaar. *Journal of Scientific Instruments*, v. 34, July 1957, p. 279-280.

Measuring elements are U-pieces to which wire resistance strain gages are cemented.

16305 Two Portable Thermistor Radiometers. W. H. Ward. *Journal of Scientific Instruments*, v. 34, Aug. 1957, p. 317-321.

Construction and calibration of instruments for micrometeorological studies. One instrument measures the hemispherical short-wave radiation and the other measures directly the total radiative flux through a plane.

16306* (French.) Ionospheric Turbulence and Propagation of Electromagnetic Waves. **Turbulence ionosphèrique et propagation des ondes électromagnétiques.** T. Kahan. *Nuovo Cimento (Supplemento)*, v. 4, ser. 10, no. 4, 1956, p. 1352-1384.

Definition of ionospheric turbulence. Its measurements, Navier equations, average values, and statistics. Analysis of velocity as a function of time. Fluctuations of density in homogeneous turbulence. Velocity spectrum.

16307 Monthly Index of Conditions Affecting Water Supply. Paul Kaser. *Ohio Department of Natural Resources, Division of Water*, July 1957, 7 p. (GB1025 Oh3a Contin.)

Ohio hydrologic data.

16308 How Fracture Initiation Can Be Controlled. Bruce Gilbert, George Neill, and Roscoe Clark. *Oil and Gas Journal*, v. 55, Aug. 5, 1957, p. 64-67.

This new fracture initiation tool permits orientation of fractures in wells.

16309 How to Speed Drilling in Shale. R. A. Cunningham and W. C. Goins, Jr. *Oil and Gas Journal*, v. 55, Aug. 5, 1957, p. 88 + 5 pages.

Oil in drilling mud and jet action at the bottom of the hole improves rate of drilling.

16310 How Rock and Fluid Properties Affect Flow in the Reservoir. F. E. Merliss, J. D. Doane, and M. J. Rzasa. *Oil and Gas Journal*, v. 55, Sept. 2, 1957, p. 153-159.

Permeability, a measure of the flow characteristics, directly affects reservoir performance. Commonly accepted factors affecting the permeabilities are fluid saturations and saturation history.

16311 New Process Initiates Formation Fractures in One Controlled Plane. J. E. Kastrop. *Petroleum Engineer (Management Ed.)*, v. 29, Aug. 1957, p. B21-B25.

New method developed for establishing stress concentrations in the formation rock in the desired plane and initiating the fracture with an extremely low fluid-loss material.

16312 Properties of Petroleum Reservoir Fluids. Emil J. Burcik. 190 p. 1957. John Wiley & Sons, New York. (TN871 B89p)

A treatment of the properties and behavior of reservoir fluids with examples and problems.

16313 (French.) Study in a Few Problems of Deep Fluid Waves. **Étude de quelques problèmes sur les ondes liquides de gravité.** Georges Brillouet. *Publications Scientifiques et Techniques du Ministère de l'Air*, 1957, no. 329, 144 p. (TL502 F84.1p Vis.)

Investigation of the general harmonic function $\phi(x,y)$ of two variables x and y. Application to the problem of the deep water waves as an approximate representation of the sea motion near the coasts.

16314 Mining Review. *South Australian Department of Mines No.* 102, 1957, 139 p. (TN122.S6 So87.5m Contin.)

A survey of reports of investigations carried on during the first half year 1955.

16315* (Russian.) Origin of Cosmic Rays. **Proiskhozhdenie kosmicheskikh luchei.** V. L. Ginzburg. *Uspekhi Fizicheskikh Nauk*, v. 62, no. 2, June 1957, p. 37-98.

Theory of cosmic ray origin based on radioastronomical and other experimental data. Composition of earth cosmic rays and of galaxies. Mathematical analysis and calculations.

16316* New Air and Gas Drilling Concepts. Philip L. McLaughlin. *World Petroleum*, v. 28, Aug. 1957, p. 46-49.

A report on new technological advances to encourage air drilling operations.

See also: **16486** (cathodic protection of oil well casings).

GRAPHIC ARTS

16317 The Mechanism of Dye Formation in Color Photography. VI. The Effect of a Non-Ionic Surfactant on the Rate of Coupling. L. K. J. Tong and M. Carolyn Glesmann. *American Chemical Society, Journal*, v. 79, Aug. 20, 1957, p. 4310-4313.

Kinetics of coupling in the presence of a non-ionic surfactant between phenols (and naphthols) and quinonediimines formed by oxidation of disubstituted-*p*-phenylenediamine were resolved in terms of simultaneous reactions in the micellar and in the aqueous regions. A method was devised for calculating the amount of the reaction in each region.

16318* Scanatron Electronic Colour Scanning Device. *British Printer,* v. 70, Aug. 1957, p. 44-45.

New machine for color correction and undercolor removal by automatic means for photogravure printing.

16319* (French.) Studying the Transparency Fluctuations of Photographic Plates Exposed to Electrons. **Étude des fluctuations de transparence des plaques photographiques exposées à des électrons.** Pierre Vernier. *Comptes Rendus,* v. 245, July 22, 1957, p. 416-419.

A theoretical and practical study of the role of the photographic plate with a determination of its optimum use.

16320* (French.) Electronically Engraved Plates. **Les clichés électroniques.** Jean Mincel. *France Graphique,* v. 11, no. 137, July 1957, p. 8-13.

Operation and performance of machines for electronically engraving plates.

16321* Electronic Color Scanning and Engraving. Samuel W. Levine. *Gravure,* v. 3, Aug. 1957, p. 16 + 4 pages.

A review of the activities of all known companies working on the development of scanners and engravers for the graphic arts field is presented in some detail and the characteristics of the machines are given.

16322 Microphotography. Photography at Extreme Resolution. G. W. W. Stevens. 326 p. 1957. John Wiley & Sons, New York. (TR835 St47m)

16323 Modern Applied Photography. G. A. Jones. 162 p. 1957. Philosophical Library, New York. (TR705 J71m)

An outline of the major applications in industry, with emphasis on its value in research as well as in simple recording. All major modern techniques are explained.

16324* Separations With an Enlarger. James Nolan. *National Lithographer,* v. 64, Aug. 1957, p. 18 + 2 pages.

When transparencies are scheduled through an enlarger and a small auxiliary darkroom, there can be efficient color production and the normal black and white production simultaneously. (To be continued.)

16325 Some Effects of Turbulence on Photographic Resolution. A. G. Smith, M. J. Saunders, and M. L. Vatsia. *Optical Society of America, Journal,* v. 47, Aug. 1957, p. 755-757.

The extent to which localized turbulence degrades photographic resolution is markedly dependent upon the location of the disturbance along the optical path.

16326 Modern Trends in the British Printing Ink Industry. I. E. A. Apps. *Paint Manufacture,* v. 27, Aug. 1957, p. 291-295.

A discussion of important aspects of the use and manufacture of printing inks: production statistics, types of ink, raw materials, and the effect of advances in paper making and printing on ink technology.

16327* A Method of Producing Charts and Graphs on Film. Arthur L. Laufman. *Society of Motion Picture and Television Engineers, Journal,* v. 66, Aug. 1957, p. 468-469.

Motion-picture process depicts progressive growth of graphs and the possibility of their use for superimposition on live-action scenes.

16328* A Multipurpose, Continuous Processing Machine for Instrumentation Photography. D. S. Ross. *Society of Motion Picture and Television Engineers, Journal,* v. 66, Aug. 1957, p. 480-483.

Automatic "Tri-Film Processor" offers automatic programming, ready adaption to various processing techniques, automatic and leaderless loop formation, combined with a small size. Machine can process and dry four tracks of 16 mm., two of 35 mm., or one of 70 mm. film at speeds up to 6 ft./min.

See also: **16744** (quality control in photographic processing); **17051** (paper roughness tester).

HEAT POWER

16329 Some Effects of Inlet Pressure and Temperature Transients on Turbojet Engines. D. Gabriel, L. Wallner, R. Lubick, and G. Vasu. *Aeronautical Engineering Review,* v. 16, Sept. 1957, p. 54 + 6 pages.

Compressor stall as a limit of engine performance and the methods of analysis for the prediction of the stall limits are discussed.

16330 Energy Limitations of Liquid Rocket Propellants. John F. Tormey. *Aircraft Engineering,* v. 29, Aug. 1957, p. 248 + 3 pages.

An examination of the potentialities of the available chemical fuels.

16331 Drag-Turbine Performance. O. E. Baljé. *ASME, Transactions,* v. 79, Aug. 1957, p. 1291-1304.

The simplified theory presented enables predictions of performance for compressible as well as incompressible media, accounting for the influence of design geometries on performance range and peak efficiency.

16332 Power From Solar Energy. J. I. Yellott. *ASME, Transactions,* v. 79, Aug. 1957, p. 1349-1359.

Nature of solar radiation; methods for estimating the amount available at any particular location; flat-plate and concentrating collectors; technical advances, including selective surface coatings and new tube-in-sheet materials.

16333* (French.) Advantage in Adding Water or Vapor to the Combustion Chamber of a Gas Turbine. **Intérêt de l'injection d'eau ou de vapeur dans la chambre de combustion d'une turbine à gaz.** P. Chambadal. *Chaleur & Industrie,* v. 38, July 1957, p. 173-186.

Recent opinions concerning water or steam addition through the upper part of the turbine. Basic principle and calculations; addition of water from below the compressor is advantageous if pressure is high and temperature moderate.

16334 The Throttling of Wet Steam. J. H. Potter. *Combustion,* v. 29, Aug. 1957, p. 55-59.

Theory of the throttling calorimeter. Speculations upon the irreversible expansion of wet steam.

16335* (German.) Evaluation of Recuperators. **Bewertung von Rekuperatoren.** K. Stieper. *Energietechnik,* v. 7, June 1957, p. 263-270.

Methods for evaluating heat exchanger designs in terms of energy and economy. Determination of optimum rates of flow.

16336 Aerodynamic Factors in Combustion Chambers. W. G. E. Lewis and M. V. Herbert. *Engineering,* v. 184, Aug. 2, 1957, p. 143-146.

The determination of limiting heat-release rates from reaction kinetics allows a realistic comparison to be made of the performance of various types of combustion chamber primary zones. The extent to which volume requirements are dictated by chemical considerations will depend upon what other concurrent and essentially aerodynamic processes the designer requires to be carried out inside the combustion space.

16337 Limits of Combustion Intensity in Heat Engines. J. J. Groeze. *Engineers' Digest,* v. 18, July 1957, p. 303-307.

Considers fuels for boilers and furnaces or heat engines requiring hydro-carbons, finely distributed and intimately miscible with air.

16338* (French.) A Contribution to the Study of a Forced Circulation Boiler. Sample Study on a Particular Type Having a Combustion Chamber With Moderate Pressure. **Contribution à l'étude des Chaudièresà circulation forcée. Exemple d'étude d'un matériel particulier à chambre de combustion sous pression modérée.** L. Remess. *Flamme et Thermique,* v. 10, July 1957, p. 35-42.

Description of new boiler. Theoretical comparison with the classical type. Coefficient of transmission is of the order of 100 kcal/m²hr°C.

16339* Some Notes on Carburation and Other Fuel System Problems. Charles H. Fisher. *Institution of Mechanical Engineers, Automobile Division, Proceedings*, 1955-1956, no. 2, p. 49-69 + 2 plates.

Carburetor icing; anti-icing additives; hot starting and percolation; float chamber venting; part-throttle economy; carburetor flow limits; automatic chokes; test-bed tuning and exhaust back pressure; future developments.

16340* Crankcase Explosions: An Investigation Into Some Factors Governing the Selection of Protective Devices. H. G. Freeston, J. D. Roberts, and A. Thomas. *Institution of Mechanical Engineers, Proceedings*, v. 170, no. 24, 1956, p. 811-824 + 2 plates.

Remedies include the use of warning devices to detect overheating in the crankcase, and the provision of relief vents to limit the explosion pressure to a safe value.

16341* Crankcase Explosions: Development of New Protective Devices. W. P. Mansfield. *Institution of Mechanical Engineers, Proceedings*, v. 170, no. 24, 1956, p. 825-862 + 6 plates.

16342 Vibration and Strength of a Turbine Blade. I. Resonance Vibration. II. Vibration Stress and Strength. Akimasa Ono. *Japan Academy, Proceedings*, v. 33, Apr. 1957, p. 211-216; May 1957, p. 272-277.

A mathematical analysis.

16343 Thermal Stresses in an Infinite, Hollow Case-Bonded Cylinder. S. A. Zwick. *Jet Propulsion*, v. 27, Aug. 1957, p. 872-876.

Relations are obtained for the case of a thermally thin, but elastically thick shell corresponding to the practical configuration of a plastic propellant "grain" case-bonded to a metallic shell.

16344 Allocation of Heat in an Industrial Power Plant—A Practical Approach. Ronald J. Martin. *Mechanical Engineering*, v. 79, Aug. 1957, p. 743-746.

A simple and accurate method of determining the cost of heat energy for power generation and process uses.

16345* (German.) Water Injection in the Internal (Reciprocating) Combustion Engine. **Wassereinspritzung in den Ottomotor.** Gerhard Chonê. *MTZ: Motortechnische Zeitschrift*, v. 18, July 1957, p. 203-208.

Water injected during the compression stroke or into the intake manifold acts as an anti-knock agent and changes the cycle temperatures and the amount of heat transferred. Application in airplane engines. Supercharging in connection with water injection is economical in all cases in which short power boosts are required.

16346 A Special Report on Turbines. *Petroleum Refiner*, v. 36, Aug. 1957, p. 109-137.

Series of articles on the selection of turbines for industrial applications; foundation design.

16347* Prevention of Destructive Engine Failure by Spectrographic Oil Analysis. R. E. Linnard, C. E. Thrakeld, and R. T. Blades. *Pipe Line News*, v. 29, Aug. 1957, p. 70-74.

Application of technique of emission spectrographic examination of used oil samples from stationary engines is described as practical aid in controlling engine operations of pipeline system.

16348* How to Use Your Stack "Pump". R. B. Engdahl and Auburn Smith. *Power*, v. 101, Aug. 1957, p. 106-107.

Chimneys are pictured as "pumps" which pump air to the boilers and move combustion gas away. The stack pumps when the gas column weighs less than an equivalent outside imaginary air column. Stack friction, and hence size, is important because it decides how much air will flow. Too small a cross-section results in too high a friction loss, so that the stack will either fail to supply enough combustion air or spill some of the combustion products into the building.

16349 Helium Gas Turbine Nuclear Plants for High Temperature Power Cycles. *Power Engineering*, v. 61, Aug. 1957, p. 78-81.

Design of a reactor that promises high temperature and high pressure steam conditions of the same order of the most advanced fossil-fuel fired plants and thermal efficiencies greater than the present high-efficiency plants.

16350 Phosphorus Fuel Additives Reduce Spark-Plug Fouling. C. A. Hall, R. C. Beaubier, E. C. Marckwardt, and R. L. Courtney. *SAE Journal*, v. 65, Aug. 1957, p. 60-62.

The road-test data presented reflect the effects of P under conditions and in terms, more practical to a car owner than those of the usual laboratory tests.

16351* Steam Power Plant Developments. Jacques Gaspar. *Sulzer Technical Review*, v. 38, no. 4, 1956, p. 1-26.

16352 Propellant Vaporization as a Criterion for Rocket Engine Design; Calculations of Chamber Length to Vaporize a Single *n*-Heptane Drop. Richard J. Priem. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3985, July 1957, 41 p. (TL570 Un3t)

Calculations based on droplet-evaporation theory show that for a given combustor length the percent of fuel mass vaporized can be increased by decreasing the fuel-drop size and the initial drop velocity, or by increasing chamber pressure, final gas velocity, and initial fuel temperature.

16353* (German.) Fundamental Laws for the Control of Gas Turbines in Jet-Powered Aircraft. **Regelungsgrundlagen für Flugzeugstrahlturbinen.** Leo Beck. *Zeitschrift für Flugwissenschaften*, v. 5, July 1957, p. 198-204.

Included in the discussion are gas turbines with and without afterburners as well as with and without adjustable jet nozzles.

See also: **16088** (transient behavior of heat exchangers); **16105** (steam turbine starting procedures); **16280** (drop-burning rates of liquid fuels); **16775** (differences in fuel fired and nuclear power stations); **17033** (heat pump buried coil configuration).

INFORMATION—PREPARATION AND DISSEMINATION

16354 Carrier Corporation Engineering Library. Eleanor B. Gibson. 83 p. 1956. Carrier Corp., Syracuse. (Z710 G35c Over.)

Library procedures manual outlining methods of literature searching and preparation of reports.

16355* Preparation and Evaluation of an Industrial Report. Charles L. Tutt, Jr. *General Motors Engineering Journal*, v. 4, July-Aug.-Sept. 1957, p. 30-33.

16356 Want to Improve Your Technical Writing? Kalman Steiner. *Heating, Piping & Air Conditioning*, v. 29, Aug. 1957, p. 102-105.

A method to help you write better technical articles, reports, and other material and do it more effectively and easily.

16357* International Guide to European Sources of Technical Information. Gerard A. Dreyfus, editor. 439 p. 1957. European Productivity Agency of the Organisation for European Economic Co-Operation, Paris. (T12 E9i Ref.)

16358 A Simple, Rapid System of Coding and Abstracting Chemical Literature Using Machine-Sorted Punched Cards. Stanley Kirschner. *Journal of Chemical Education*, v. 34, Aug. 1957, p. 403-405.

16359* Semantics in Report Writing. Herbert B. Michaelson and Robert H. Holden. *TWE Journal*, 1957, Summer, p. 1-4.

Some special aspects of semantics of interest to report writers, including a psychological interpretation of verbal comprehension, the problem of special terminologies, the use of words having several meanings, and the use of vague, generalized expressions. A specific method is suggested for improving the intelligibility of reports.

16360* What the Technical Magazine Editor Wants. Philip W. Swain. *TWE Journal*, 1957, Summer, p. 13-15.

Writers of technical articles are urged to present the story directly, clearly, and simply.

INSTRUMENTATION

16361* (English.) **Point Sources for X-Rays.** Julian Auleytner. *Acta Physica Polonica*, v. 16, nos. 1-2, 1957, p. 35-47.

The electrode beam is collimated by means of an electrostatic lens. The different focus sizes are obtained by changing the position of the cathode filament with respect to the grid diaphragms and by changing the grid potential with respect to that of the cathode. The tube wave has an original design.

16362 Measuring Particle Size. Morris J. Root. *Aerosol Age*, v. 2, Aug. 1957, p. 21 + 1 page.

A simple and quick technique for obtaining qualitative comparison of spray patterns using a dye-talc mixture.

16363 Hydrogen-Protected Wire-Wound Resistance Furnaces. II. Louis Navias. *American Ceramic Society, Bulletin*, v. 36, Aug. 1957, p. 297-301.

BeO tube furnaces with W wire zig-zag winding; comparison between 24 in. long Al_2O_3 tube and BeO tube furnace with Mo winding; zirconia tube furnaces.

16364* The Sonic Leak Detector. L. A. McElwee and T. W. Scott. *American Gas Journal*, v. 184, Aug. 1957, p. 14-17.

The sonic method has proved to be useful for finding the exact location of leaks in gas mains.

16365 Experimental Error in Determining Certain Peak Locations and Distances Between Peaks in X-Ray Powder Diffractometer Patterns. F. Chayes and W. S. MacKenzie. *American Mineralogist*, v. 42, July-Aug. 1957, p. 534-547.

The exact numerical results apply strictly only to the specific operator-instrument combination which generated the data. The evaluation procedures should be widely applicable.

16366 A Thermal Increment Diffractometer. William A. Bassett and Davis M. Lapham. *American Mineralogist*, v. 42, July-Aug. 1957, p. 548-555.

A furnace has been designed to fit the Philips X-ray diffractometer. The temperature may be raised at a uniform rate or maintained at a controlled level from 0 to 1000 C.

16367* A Method for Waterproofing Bonded Electrical-Resistance Strain Gages. Ross E. Morris and Robert R. James. *American Society of Naval Engineers, Journal*, v. 69, Aug. 1957, p. 527-530.

16368* (French.) The Omegatron and Its Applications. **L'omégatron et ses applications.** R. J. Warnecke, Jr. *Annales de Radioeléctricité*, v. 12, July 1957, p. 258-281.

Spectrometer ensures the rapid detection of leaks less than 10^{-4} mm.^{3} per hr. at NTP. Procedure is described of the search for leaks by the exploration of the container to be examined using a reference jet of gas.

16369* Precise Measurement of Isotope Ratios With a Single Collector Mass Spectrometer. J. Schutten, A. J. H. Boerboom, T. V. D. Hauw, and F. Monterie. *Applied Scientific Research*, v. 6, sec. B, no. 5, 1957, p. 388-392.

A simple electronic circuit is described, making possible a precise determination of isotope ratios measured with a single collector mass spectrometer. For $^{13}C/^{12}C$ measurements, an accuracy of better than 1% is obtained, corresponding to an absolute sensitivity of better than $1:10^5$.

16370* (German.) A Differential Refractometer for Precision Measurements. **Ein Differentialrefraktometer für Präzisionsmessungen.** O. Bodmann. *Chemie-Ingenieur-Technik*, v. 29, July 1957, p. 468-473.

Principles of operation, construction, and calibration.

16371* A New Voltage Time Recorder for Transient Measurements. C. M. Foust and B. V. Bhimani. *Communication and Electronics*, 1957, July, p. 253-262.

The RC voltage-time recorder is described for random voltage measurements.

16372 The Gauging of Parallel Membranes Within Long Tubes. Leslie E. Goodwin. *E. I. du Pont de Nemours & Co., Research and Development Report (U. S. Atomic Energy Commission)*, DP-203, Feb. 1957, 12 p. (UF767 Un3.1dp Contin.)

An instrument is described that measures the separation between two parallel Al membranes inside an Al tube over 10 ft. long. Variation from the nominal separation is indicated on zero-center micro-ammeters. The testing of the tube requires less than 10 min. The separation is measured with an accuracy of ± 0.001 in.

16373* (Russian.) Gamma-Ray Determination of Moisture in Materials. **Opredelenie vlazhnosti materialov metodom gammaskopii.** L. G. Polozova and R. P. Reizman. *Eesti NSV Teaduste Akadeemia, Toimetised. Tehniliste ja Füüsikalis-Matemaatiliste Teaduste Seeria*, v. 6, no. 2, 1957, p. 122-130.

An economical method based on the behavior of γ-rays from radioactive isotopes in different materials. When material moisture increases, the intensity of a narrow γ-ray beam also increases.

16374 Temperature Measurements Near Absolute Zero. Herbert B. Sachse. *Electronic Industries & Tele-Tech*, v. 16, Sept. 1957, p. 58 + 5 pages.

Research in thermometry below 4 K.

16375* (German.) Mounting Fine Instrument Parts in Air. **Luftgelagerte Bauelemente im Feingerätebau.** R. Lehmann, A. Wiemer, and H. Endert. *Feingerätetechnik*, v. 6, July 1957, p. 291-298.

Basic principles as well as these initial experiments indicate that mounting and lubricating fine instrument parts in air has many advantages not found in conventional oil or roller mountings.

16376* (German.) Thin Optical Layers. The Problems of Optical "Glass Compensation". **Dünne optische Schichten. Über die Aufgaben der optischen "Glasvergütung".** H. Pohlack. *Feingerätetechnik*, v. 6, July 1957, p. 307-311.

Characteristics, testing, and uses of optical layers. The most important methods of production. (To be continued.)

16377 Level Vials—Their Manufacture, Use, and Peculiarities. Douglas L. Parkhurst. *Franklin Institute, Journal*, v. 264, Aug. 1957, p. 105-116.

16378* The Design and Performance of a New Experimental Single-Transient Oscillograph With Very High Writing Speed. M. E. Haine and M. W. Jervis. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, no. 16, July 1957, p. 385-392.

16379* A 1000-Channel Neutron-Velocity Spectrometer Using Ferrite Data Storage. F. H. Wells and J. G. Page. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, Suppl. no. 7, 1957, p. 470-480.

The electronic sorting and counting equipment for a spectrometer using "time of flight" techniques in the energy range 1-1000 e.v., the neutron source being a nuclear reactor in conjunction with a mechanical shutter.

16380* Calculation of the Effect of Loading Resistive Potential Dividers. J. P. Newsome. *Instrument Practice*, v. 11, July 1957, p. 742-745.

A rapid and reliable method based on the use of equivalent circuits in determining the effective ratio of a loaded potential divider.

16381* (French.) Design of a Magnetometer and of a Magnetic Field-Gradient Meter. **Réalisation d'un magnétometre et d'un mesureur de gradient de champ magnétique.** Maurice Spighel. *Journal de Physique et le Radium (Suppl.)*, v. 18, July 1957, p. 108A-111A.

Device for measurement of the magnetic field and magnetic field-gradient in a spectrograph has an oscillating rotative coil and a linearly vibrating coil.

16382 Design and Performance of a High-Efficiency Laboratory Electro-Magnet. L. O. Bowen. *Journal of Scientific Instruments*, v. 34, July 1957, p. 265-268.

A 2.5 ton device yielding power efficiencies approximately 10% in excess of similar magnets.

16383 A Method of Stabilizing the Specimen Temperature for Single Crystal X-Ray Crystallography. D. E. Henshaw. *Journal of Scientific Instruments*, v. 34, July 1957, p. 270-271.

For automatic control of specimen temperature down to −130 C.

16384 The Use of Ferroelectric Ceramics for Vibration Analysis. R. C. Kell, G. A. Luck, and L. A. Thomas. *Journal of Scientific Instruments*, v. 34, July 1957, p. 271-274.

Ferroelectric ceramics as used in accelerometers and in vibration strain gages.

16385 An Automatic Null Method Recording Manometer. H. R. B. Hack. *Journal of Scientific Instruments*, v. 34, July 1957, p. 280-282.

16386 Ultra-High Vacua. J. Yarwood. *Journal of Scientific Instruments*, v. 34, Aug. 1957, p. 297-304.

Use of the ionization gage both as a pump and as a measuring instrument in the pressure range from 10^{-6} to 10^{-11} mm. Hg. Experimental results indicate that Alpert's claims regarding electrical pumping speed are justified provided that the initial pressure is sufficiently low.

16387 A Sensitive Electronic Strain Gauge. H. L. Allsopp, D. F. Gibbs, and H. H. Wills. *Journal of Scientific Instruments*, v. 34, Aug. 1957, p. 308-311.

Developed for investigating the electromechanical properties of ferroelectric $BaO \cdot TiO_2$. The lower limit of its response time is determined mainly by the mechanical system coupling the specimen to the gage, and is of the order of 1 ms.

16388* (Russian.) Radioactive Level Regulator and Signaler. **Radioaktivnyi reguliator i signalizator urovnia.** V. V. Aronovich and B. D. Summ. *Khimicheskaia Promyshlennost'*, 1957, no. 4, June, p. 32-34.

Description of γ-ray apparatus for controlling and signaling the level of a fluid.

16389 Particle-Size Distribution of Thorium Oxide by a Centrifugal Sedimentation Method. O. Menis, H. P. House, and C. M. Boyd. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2345, Aug. 1957, 34 p. (UF767 U3o Contin.)

A cumulative, centrifugal sedimentation method, which is applicable to the determination of the particle-size distribution of thorium oxide in the particle-size range of 0.1 to 2.0μ in diameter is described.

16390 Absolute Radiometry Based on a Change in Electrical Resistance. Marion Eppley and Alton R. Karoli. *Optical Society of America, Journal*, v. 47, Aug. 1957, p. 748-755.

A blackbody and an electrical method of absolute radiometry employing d.c. instruments. A description of the apparatus used in the assemblage, as well as of the procedure followed in obtaining data, with a discussion of the probable sources of error.

16391* (Russian.) Use of Germanium Photodiodes in Infrared Pyrometric Equipment. **Germanievye fotodiody v sistemakh infrakrasnoi pirometrii.** D. Ia. Svet. *Priborostroenie*, no. 6, June 1957, p. 16-17.

Spectral features of germanium photodiodes and the light filters used. Relationship between the logarithm of spectral ratio, and the inverse values of the temperature of the emitter.

16392* (English.) **The "Kompensograph"—A New Electronic Potentiometer Recorder.** Hans Poleck and Kurt Mall. *Siemens Review*, v. 24, Jan. 1957, p. 18-21.

With the aid of a servo mechanism the magnitude of the output voltage of the potentiometer is adjusted to that of the measuring potential, indicated on an expanded scale and recorded on a strip chart.

16393* (German.) Mode of Operation and Performance of Simple Volume Gages. **Arbeits- und Wirkungsweise einfacher Volumenmessgeräte. II.** Glass Equipment. **Glasgerätekunde.** Heinz Wilhelm. *Sprechsaal*, v. 90, July 1957, p. 345-347.

Natural law underlying the measurement of definite amounts of liquid with glass equipment. Specific weight and temperature. Correction of various possible errors. Different types of glass equipment and its uses.

16394* (German.) Electric Strain Gages in Testing of Materials. **Der elektrische Dehnungsmesstreifen in der Werkstoffprüfung.** Walther Köhler. *Werkstoffe und Korrosion*, v. 8, July 1957, p. 389-393.

Advantages of strain gages for solving special problems with materials. Suitability for static tensile strength; testing by checking accuracy and linearity of indication under single and multiple stress in the elastic range.

16395* (Russian.) Improving the Method of Color Defect Detection. **Usovershenstvovanie metoda tsvetnoi defektoskopii.** S. I. Kalashnikov and N. P. Kichin. *Zavodskaia Laboratoriia*, v. 23, July 1957, p. 806-808.

Development of new colors as a first step in improving the method. Description of colors and their usage.

See also: **15749** (distillation laboratory); **16299** (history of the telescope); **16304** (compressometer); **16823** (reactor instrumentation); **16826** (resistance thermometer); **16967** (parabolic mirrors).

LUBRICATION AND FRICTION

16396 The Fluid Dynamic Theory of Gas-Lubricated Bearings. J. S. Ausman. *ASME, Transactions*, v. 79, Aug. 1957, p. 1218-1224.

A perturbation solution of Harrison's gas bearing equation is proposed and carried out for the special case of an infinitely wide, self-lubricating journal bearing.

16397 Heat-Transfer Effects in Hydrostatic Thrust-Bearing Lubrication. W. F. Hughes and J. F. Osterle. *ASME, Transactions*, v. 79, Aug. 1957, p. 1225-1228.

A simplified model was constructed for intermediate situations in which heat transfer occurs in the lubricant and bearings; bearing performance was essentially isothermal at an elevated temperature.

16398 Predominant-Peak Surface Roughness, a Criterion for Minimum Hydrodynamic Oil-Film Thickness of Short Journal Bearings. L. F. Kreisle. *ASME, Transactions*, v. 79, Aug. 1957, p. 1235-1241.

The transition from full hydrodynamic-film lubrication to marginal lubrication appears to occur when the minimum oil-film thickness equals the sum of the predominant-peak surface roughnesses of the bearing and journal measured in the circumferential direction after run-in of the bearing and journal pair.

16399 Statistical Analysis of a Wear Process. B. G. Rightmire. *ASME, Transactions*, v. 79, Aug. 1957, p. 1242-1246.

Oxidation of the contacts plays a critical role in determining the metal transfer and wear; new experiments are suggested and the anticipated results for two cases discussed.

16400 Testing Dynamically Loaded Bearings. I. A Short History of Bearing Test Machines. II. A Diesel-Engine Bearing Test Machine. R. B. Snapp and M. D. Hersey. *ASME, Transactions*, v. 79, Aug. 1957, p. 1247-1266.

Test machine consisting of a motor-driven modification of a commercially available diesel engine is described; developed primarily for endurance testing of engine-bearing materials and design.

16401 Radiation Resistant Lubricants — Their Development and Status. R. O. Bolt, J. G. Carroll, and J. R. Wright. *California Research Corporation (U. S. Atomic Energy Commission)*, TID-5186(Del.), June 1954, 61 p. (UF767 Un3ti Contin.)

Summary of the information from γ radiation stability experiments and lubrication functional tests in the absence of radiation.

16402* Properties of Integral Seal Ball Bearings and Their Use by the Engineer. Michael T. Monich and Carter T. Bragdon. *General Motors Engineering Journal*, v. 4, July-Sept. 1957, p. 8-15.

Design simplification and absence of maintenance requirements are the prime advantages of sealed bearings. Several types of bearings and lubricants are discussed.

16403 A Report on the Use of Silicone Lubricants at Wheaton Glass Company. Thomas W. Bailey. *Glass Industry*, v. 38, Aug. 1957, p. 433 + 8 pages.

Use of a mist spray unit to apply silicone emulsions.

16404 Role of Atmospheric Oxidation in High Speed Sliding Phenomena. M. Cocks. *Journal of Applied Physics*, v. 28, Aug. 1957, p. 835-843.

The role of oxidation in inhibiting metallic interaction between metal surfaces sliding at high speeds (up to 66 m/sec.), as detected by microscopic examination of the surface damage after sliding, is described. By using hardened steel, information concerning surface temperatures was deduced from subsequent hardness measurements.

16405 Metal Transfer in Sliding Contacts. D. G. Flom. *Journal of Applied Physics*, v. 28, Aug. 1957, p. 850-854.

Transfer of radioactive Ag was studied quantitatively in sliding contacts containing graphite and metal. The rate of transfer from silver-graphite riders to graphite cylinders is initially high but soon approaches a limiting equilibrium state.

16406* (Russian.) Effect of Physico-Chemical Properties of Lubricating Oils on Energy Loss in a Gear Transmission. **Vliianie fiziko-khimicheskikh svoistv smazochnykh masel na poteri energii v shesterenchatoi peredache.** K. I. Klimov and A. V. Vilenkin. *Khimiia i Tekhnologiia Topliva, i Masel*, 1957, no. 7, July, p. 39-42.

Losses do not depend on the chemical composition or the method of manufacturing the oil, but on the viscosity at a given temperature. Energy losses are determined from viscosity resistance. To keep losses low it is recommended that oils with low viscosity, and increasing only slowly with decreasing temperature be used.

16407* (English.) **Oil Fog Lubrication of High Speed Ball Bearing.** Tokio Sasaki, Haruo Mori, and Toshio Teshima. *Kyoto University, Memoirs of the Faculty of Engineering*, v. 19, no. 2, Apr. 1957, p. 123-134.

The influences of oil and air consumption, viscosity and additive of oil, preload, and rotating speed were investigated.

16408 Linear Ball Bushings. Howard R. Havemeyer. *Machine Design*, v. 29, Aug. 22, 1957, p. 120-127.

Ball bushings have several advantages over plain sliding bearings. Friction is extremely low, binding and chatter is eliminated, and a high degree of precision can be attained. The substitution of rolling for sliding friction minimizes the need for lubrication and solves many of the lubrication problems usually associated with sliding bearings.

16409 Bearing Characteristics of Nickel-Base Alloys. R. K. Kozlik. *Machine Design*, v. 29, Aug. 22, 1957, p. 139 + 2 pages.

A presentation of data on the characteristics of various alloys.

16410* The Viscosity/Temperature Relationship of Lubricating Oils. E. G. Ellis. *Petroleum*, v. 20, Aug. 1957, p. 294-298.

16411 Measuring the Abrasiveness of Carbonaceous Deposits. *Scientific Lubrication*, v. 9, July 1957, p. 16-17.

Weight loss of a test piece subjected to an oil suspension of carbonaceous deposits is used as an index of wear or abrasiveness.

16412* Infrared Studies of Bentone Grease-Water Systems. E. C. Milberger, A. F. Miller, and V. R. Damerell. *Spokesman*, v. 21, Aug. 1957, p. 10-15.

The utilization of an infrared analytical method for determining water in grease.

16413* A Method for the Prediction of Hardness Changes of Greases in Storage. G. W. Eckert. *Spokesman*, v. 21, Aug. 1957, p. 17-22.

An accelerated storage procedure for predicting the hardness changes of greases during normal storage. One day in the accelerated storage test is equivalent to approximately 2.4 months in the normal storage test for hardness changes on an unworked basis.

See also: **15697** (refining of lube oil); **15752** (analysis of lube oil); **15806** (analysis of antifriction alloys); **16347** (analysis of lubricating oil); **16375** (air-lubricated bearings); **16418** (fire resistant hydraulic fluids); **16498** (corrosion by motor oils); **16649** (lubricants in metal working); **16652** (cold-rolling mill reduction lubricants).

MECHANICAL ENGINEERING

16414* (Russian.) Calculation of Symmetrically Loaded Anisotropic Rotating Shells. **K raschetu simmetrichno nagruzhennykh sloistykh anizotropnykh obolochek vrasheheniia.** D. V. Peshtmaldzhian. *Akademii Nauk Armianskoi SSR*, v. 10, no. 2, 1957, p. 39-54.

Mathematical analysis.

16415 Can Chrome Plating Solve Machine Way Problems? Louis W. Raymond. *American Machinist*, v. 101, Aug. 26, 1957, p. 124-127.

Hard chrome plate reduces friction and is virtually wear-proof.

16416* Temperature Control in Hydraulic Systems. Allan E. Morris. *Applied Hydraulics*, v. 10, Aug. 1957, p. 69-84.

Heat generation; temperature effects on fluids and packings; natural heat dissipation; system design to reduce heating; oil coolers; immersion heaters; automatic temperature control.

16417* Reducing Static Reaction in Spool-Type Valves. R. I. Sinclair and D. E. Turnbull. *Applied Hydraulics*, v. 10, Aug. 1957, p. 106 + 2 pages.

The relative merits of four methods.

16418* Fire-Resistant Hydraulic Fluids. III. Phosphate Ester Base Types. F. H. Langenfeld. *Applied Hydraulics*, v. 10, Aug. 1957, p. 114 + 4 pages.

16419 Applied Strength of Materials. Alfred Jensen. 343 p. 1957. McGraw-Hill, New York. (TA405 J45a)

Basic information necessary for the successful design of machine parts and of structural members, parts, and connections.

16420* The Transverse Flexure of Thin Elastic Plates Supported at Several Points. W. A. Bassali. *Cambridge Philosophical Society, Proceedings*, v. 53, July 1957, p. 728-743.

Explicit formulas for the deflexion, bending and twisting moments, and shearing stresses are given at any point of the plate.

16421* Load Distribution on Helical Gear Teeth. I. M. D. Trbojevic. *Engineer*, v. 204, Aug. 9, 1957, p. 187-190.

Load distribution along lines of contact for various positions of the contact lines and for various helix angles. A method for determining partial loads acting on teeth simultaneously in contact. Conditions for most convenient load distribution. Position of least favorably loaded contact line. (To be concluded.)

16422* Shock Waves in Helical Springs. J. Dick. *Engineer*, v. 204, Aug. 9, 1957, p. 193-195.

Analysis of the production and dissipation of a simple shock wave, in the case of a compression wave of an intensity greater than that which would just give contact between adjacent coils of the spring.

16423 Plastic Yielding of I-Beams. A. P. Green and B. B. Hundy. *Engineering*, v. 184, July 19, 1957, p. 74-76.

Shear loading effects are analyzed. (To be continued.)

16424 Flexible Couplings. *Engineers' Digest*, v. 18, July 1957, p. 271-302.

Survey provides users of flexible couplings with descriptions of the various types now commercially available, and indicates the main differences between non-metallic and metallic couplings.

16425* The Development of the General Motors Air Spring. Von D. Polhemus and Lawrence J. Kehoe, Jr. *General Motors Engineering Journal*, v. 4, July-Sept. 1957, p. 16-20.

New innovation of air spring for passenger cars developed from GM coach model.

16426* Determine the Design Specifications for a Pressure Regulator Coil Spring. Ivan K. Lukey and William H. Lichty. *General Motors Engineering Journal*, v. 4, July-Sept. 1957, p. 49-51.

Space limitations imposed by the valve body design require a coil spring capable of withstanding high stress. This stress, coupled with the temperature at which the spring operates and the load loss limitation, dictates the selection of a spring material having the required stress and heat resisting properties.

16427* (German.) Cast Machine Parts and Their Design. **Gegossene Maschinenelemente und ihre konstruktive Behandlung.** Herbert Klotz. *Giessereitechnik*, v. 3, July 1957, p. 153-156.

Suggestions for design changes in many types of cast machine parts to reduce the number of rejects.

16328* Overdrives: Problems in Their Application and Design. S. H. Ashby. *Institution of Mechanical Engineers, Automobile Division, Proceedings*, 1955-1956, no. 3, p. 71-88.

16429* The Performance of an Axial-Flow Pump. E. A. Spencer. *Institution of Mechanical Engineers, Proceedings*, v. 170, no. 25, 1956, p. 874-883.

Reasonable efficiencies can be achieved using a design method based on modified airfoil theory and free-vortex conditions. Aerodynamic theory assists in the analysis of conditions near the design point and allows rough predictions to be made on how the pump will behave in altered circumstances.

16430* Bending of Plating With Widely Spaced Stiffeners. J. C. Chapman and Jean E. Slatford. *Institution of Mechanical Engineers, Proceedings*, v. 170, no. 37, 1956, p. 1101-1112.

A numerical example illustrates the application of the analysis to the transverse bending of a ship's side. An experiment is described which confirms the theoretical conclusions for an initially flat plate.

16431 The Stability of Thin-Walled Unstiffened Circular Cylinders Under Axial Compression Including the Effects of Internal Pressure. Leonard A. Harris, Herbert S. Suer, William T. Skene, and Roland J. Benjamin. *Journal of the Aeronautical Sciences*, v. 24, Aug. 1957, p. 587-596.

16432 Bending Strength of Tubing in the Plastic Range. Clifford S. Ades. *Journal of the Aeronautical Sciences*, v. 24, Aug. 1957, p. 605-610.

A method is presented for determining the total work of a bent and deformed tube subjected to stresses in the plastic range. It is possible to determine the shape of the cross section of the tube as a function of its longitudinal curvature and also to determine the bending moment carried by the tube.

16433 Evaluation of Transient Temperatures and Stresses. R. J. Fritz. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission)*, KAPL-951 (Rev.), July 1957, 37 p. (UF767 Un3.1ka Contin.)

The maximum thermal stresses are given for a flat plate due to a given surface temperature change at a linear rate. Thermal stresses in thin cylindrical shells are discussed, and an example is evaluated. Design factors are discussed briefly.

16434 Cable Vibration Mounts. R. G. Hartenstein and J. J. Kerley, Jr. *Machine Design*, v. 29, Aug. 8, 1957, p. 99-100.

A new technique for handling shock loads and H.F. vibration.

16435 Preferred Gear Sizes. Gustav A. Larson. *Machine Design*, v. 29, Aug. 8, 1957, p. 113-117.

Tables of dimensions for precision gears based on a preferred series of diametral pitches.

16436 How to Select and Apply Pressure Switches. William B. Wallace, Jr. *Machine Design*, v. 29, Aug. 22, 1957, p. 106-114.

A cross-section of the various pressure-switch types is presented, and the relationship of system characteristics to switch selection is examined.

16437 New Materials That the Design Engineer Should Know About. *Mechanical Engineering*, v. 79, Aug. 1957, p. 720-732.

Developments in the fields of metallic materials, ceramics and refractory materials, plastics and rubbers, and coatings and finishes.

16438 Hydraulic Torque Converters. A Versatile Drive. H. L. Willke. *Mechanical Engineering*, v. 79, Aug. 1957, p. 738-740.

Basic advantages are flexibility, shock-absorbing ability, and mechanical simplicity.

16439 Stress Analysis for Orsort Student. C. O. Smith. *Oak Ridge School of Reactor Technology (U. S. Atomic Energy Commission)*, CF-56-10-139, Oct. 1956, 365 p. (UF767 Un3.1cf Contin.)

Manual of basic ideas and method involved in stress analysis.

16440* (Russian.) The Center of Deflection. **O tsentre izgiba.** V. V. Novozhilov. *Prikladnaia Matematika i Mekhanika*, v. 21, no. 2, Mar.-Apr. 1957, p. 281-284.

To determine the coordinates of the deflection center, it is not necessary to solve the problem of rod bending caused by transverse force. The finding of the center point is reduced to quadratures.

16441 Surge Waves in Compression Springs. Karl Maier. *Product Engineering*, v. 28, Aug. 1957, p. 167-174.

New design equations give accurate analysis of spring expansion, velocity, impact, and vibration.

16442 How to Apply O-Rings. Joseph G. Adiletta. *Product Engineering*, v. 28, Aug. 1957, p. 176-182.

Simplified principles for proportioning mechanical parts to achieve maximum sealing at minimum cost. Effect of factors such as fluid pressure, surface finish and eccentricity of shaft and cylinder on initial "squeeze," cross-section ring diameter, and Durometer of rubber.

16443 (French.) Three Dimensional Photoelasticity. Theoretical and Experimental Aspects. **Photoélasticité tridimensionnelle aspects théoriques et expérimentaux.** Claire L. Gaudfernau. *Publications Scientifiques et Techniques du Ministère de l'Air*, 1957, no. 330, 86 p. (TL502 F84.1p Vis.)

Development of photoelasticity, linear elasticity, plane, and tridimensional photoelasticity. Direct method, determination of stress values by means of the Mohr circle. Application to a twisted beam.

16444 The Use of Normal Modes in Problems of Forced Vibration and Impact. R. P. N. Jones. *Royal Aeronautical Society, Journal*, v. 61, Aug. 1957, p. 552-559.

By expressing the deflection of an elastic system in terms of the normal co-ordinates, simple solutions may be obtained for problems of forced vibration or impact. It is necessary to know the natural frequencies of the system, the shapes of the normal modes, and the kinetic or strain energy associated with each mode.

16445 On the Plastic Theory of Plates. H. G. Hopkins. *Royal Society, Proceedings*, v. 241, ser. A, Aug. 7, 1957, p. 153-179.

Theory of small deformations of a thin uniform plate under transversal load.

16446 Studies in Collapse Analysis of Rigid-Plastic Plates With a Square Yield Diagram. E. H. Mansfield. *Royal Society, Proceedings*, v. 241, ser. A, Aug. 20, 1957, p. 311-338.

The collapse loads and mechanisms of a rigid-plastic plate with a square yield diagram, such as continuously reinforced concrete plate are considered. Particular attention is paid to the case of a single concentrated load applied to a plate of arbitrary plan and with arbitrary boundary conditions. Upper-bound solutions are also given for a uniformly loaded plate of regular polygonal plan.

16447 Air Springs for Vehicle Suspension. J. Sainsbury. *Rubber Developments*, v. 10, Summer 1957, p. 38-42.

Comparison of air and steel springs for motor transport and passenger vehicles. Two American automobile manufacturers are planning to install pneumatic suspension systems on their 1958 models.

16448 Steel Sandwich Structure to Highlight New Fighter Aircraft. Alf Fridtjof Ensrud. *SAE Journal*, v. 65, Aug. 1957, p. 38-42.

Adhesive bonds, brazing, spotwelding, and ultrasonic welding are probable means to the practical joining method needed.

16449* (Czech.) The Maintenance of Machine-Tool Hydraulic Devices. **Udrzba hydrauliky obráběcích strojů.** J. Duben. *Strojírenská Výroba*, v. 5, July 1957, p. 292-296.

A survey of the most common defects and probable causes presented in tabular form.

16450 Experimental Investigation of Creep Bending and Buckling of Thin Circular Cylindrical Shells. Burton Erickson, Sharad A. Patel, Francis W. French, Samuel Lederman, and N. J. Hoff. *U. S. National Advisory Committee for Aeronautics, Research Memorandum* RM 57E17, July 1957, 30 p. (TL782 Un3rm Vis.)

Forty-three cylinders of 40-in. length and 16-in. diameter, made of 5052-0 aluminum-alloy sheets of 0.032-, 0.040-, 0.051-, and 0.064-in. thickness, were subjected to bending moments constant along the cylinder and in time in an oven which maintained a constant temperature of 500 F during the test. All the cylinders failed by buckling. The time that elapsed between load application and collapse was measured.

16451 Handbook of Structural Stability. II. Buckling of Composite Elements. Herbert Becker. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3782, July 1957, 72 p. (TL570 Un3t)

The local buckling of stiffener sections and the buckling of plates with sturdy stiffeners are reviewed, and the results are summarized in charts and tables. Numerical values of buckling coefficients are presented for longitudinally compressed stiffener sections of various shapes, for stiffened plates loaded in longitudinal compression and in shear and for stiffened cylinders loaded in torsion.

16452 Approximate Analysis of Effects of Large Deflections and Initial Twist on Torsional Stiffness of a Cantilever Plate Subjected to Thermal Stresses. Richard R. Heldenfels and Louis F. Vosteen. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4067, 1957, 36 p. (TL570 Un3t)

The results show that initial twist and applied moments can have significant effects on the changes in stiffness produced by nonuniform heating, particularly in the region of the buckling temperature difference. Results calculated by this approximate analysis are in satisfactory agreement with measured torsional deformations and changes in natural frequency.

16453 The Calculation of Thermal Stress in Cylinders With Internal Heat Generation: Description of WBTSGl Code. Duane M. Davis and Benjamin H. Mount. *Westinghouse Electric Corporation, Atomic Power Division (U. S. Atomic Energy Commission)*, WAPD-TM-59, May 1957, 39 p. (UF767 Un3.1wa Contin.)

The WBTSGl code is intended to calculate the stress from the accurate temperature distribution for a cylinder and present the results in nondimensional form that may be used directly for design purposes.

See also: **15700** (mechanical stress from heat flow in chemical plants); **16236** (axial-flow pumps); **16343** (thermal stresses in hollow cylinder); **16464** (Ti bolts); **17082** (welding design for vibration control).

METALLURGY

16454* (Italian.) The Influence of Manganese in the Plating Alloy of the Ergalplat 55 and 65 Alloys. **Influenza del manganese su la lega di placcatura dell' Ergalplat 55 e 65.** A. Prati, A. Gragnani, and D. Gualandi. *Alluminio*, v. 26, July-Aug. 1957, p. 301-314.

For the plating of Ergal type alloys, the Al-1% Zn-1% Mn alloy is preferable to the Al-1% Zn alloy, because the addition of Mn increases the hardness, makes less intense the diffusion of alloying elements from the core, and improves the corrosion resistance of the plated alloy.

16455* Aluminum Bronzes for Marine Applications. W. Lee Williams. *American Society of Naval Engineers, Journal*, v. 69, Aug. 1957, p. 453-461.

Good physical, mechanical and marine corrosion properties are obtainable in the family of alloys known as aluminum bronzes. The use of aluminum bronzes can affect savings in cost and critical materials.

16456 Irradiation of Cast Uranium-Plutonium Base Alloys. K. F. Smith and L. R. Kelman. *Argonne National Laboratory (U. S. Atomic Energy Commission)*, ANL-5677, May 1957, 16 p. (UF757 Un3.1an Contin.)

Uranium-plutonium binary alloys containing 20 w/o of Pu show very poor metallurgical properties attributable to the presence of small amounts of the brittle zeta phase introduced when the solid solubility limit of Pu in α U is exceeded.

16457 Metallurgical Considerations of Main Steam Piping for High-Temperature, High-Pressure Service. H. S. Blumberg. *ASME, Transactions*, v. 79, Aug. 1957, p. 1377-1397.

Presents selection and behavior aspects of materials for modern high-temperature, high-pressure, steam power-plant piping; analyses possibilities of superstrength alloys for high-temperature steam piping.

16458 Austenitic Steels in High-Temperature Steam Piping. R. M. Curran and A. W. Rankin. *ASME, Transactions*, v. 79, Aug. 1957, p. 1398-1409.

Review of the operating experience and service difficulties with austenitic steel turbine piping at the 1050 and 1100 F temperature levels.

16459 Technical Survey. *Copper Development Association, Technical Survey No.* 10, July 1957, 40 p. (TN780 C79t Contin.)

A survey of the technical progress in Cu and Cu alloys during the first half of 1957.

16460 Stainless Steel Fabrication Design Chart. *Design News*, v. 12, Aug. 15, 1957, p. 114-115.

A quick reference to the principal method of fabrication in chart form.

16461 Progress in the Development of High-Duty Malleable Cast Iron. Bertil Thyberg. *Foundry Trade Journal*, v. 103, Aug. 22, 1957, p. 213-224.

Developments in the production of high-duty malleable cast iron. Effect of C, Si, and metallic alloying elements. Heat-treatment which enabled the tensile-strength range to be increased to 24.1 to 26.6 tons per sq. in.

16462 How to Check Quality in Ferritic Nodular Iron. Herman Mansfield. *Iron Age*, v. 180, Aug. 8, 1957, p. 88-91.

Data for acceptability standards on one of the widely used grades.

16463 How to Get More for Your Metalworking Dollar—Copper and Brass. *Iron Age*, v. 180, Sept. 5, 1957, p. 115 + 18 pages.

A series of articles on mechanical, physical, and fabricating properties of these two materials.

16464 Application Characteristics of Titanium Bolts. Joseph Viglione. *Machine Design*, v. 29, Aug. 8, 1957, p. 86-89.

Torque - tension relationships; relaxation properties; design recommendations.

16465 Molybdenum Parts Are Not Hard to Make. Raymond W. Yancey. *Materials in Design Engineering*, v. 46, Aug. 1957, p. 112-115.

Use of most common fabrication methods except casting is possible.

16466 Materials and Processes in Manufacturing. E. Paul Degarmo. 755 p. 1957. Macmillan Co., New York. (TS145 D36m)

A college-level text for engineering students. Deals with production and properties of materials; casting and forming processes; machining; welding and allied processes; and other manufacturing operations.

16467 Metallic Materials. Charles R. Simcoe. *Mechanical Engineering*, v. 79, Aug. 1957, p. 720-724.

Among the metals in quantity use today, but commercially unavailable a decade ago are Ti, Zr, and Mo. New processes developed include vacuum melting and vacuum casting to minimize the H content of iron and steel. Chem-milling permits the etching out of excess metal where machining would be

difficult. Cladding and honeycomb construction permit combination of metals or alloys to take advantage of their combined properties.

16468 Superpurity Aluminum. E. A. Bloch and P. H. Muller. *Metal Progress*, v. 72, Aug. 1957, p. 91-96.

The higher degree of purity of this 99.99+% Al imparts noticeably different properties from those of commercial Al, namely, greater ductility, better electrical conductivity, increased chemical stability against many agents, and better reflecting power. It also yields optically purer oxide films when anodized. Iron and Cu reduce the stability of superpurity Al against many chemical agents. Magnesium has hardly any influence up to 0.6% and Zn, Si, and Mn are also innocuous up to about 0.4%. The first practicable refining cell consisted of an iron shell with brick lining and bottom of carbon blocks. The bus bars carrying positive current are embedded in the bottom. The cell itself is subdivided by a dam or bridge into bath and forewell. The bath contains three liquid layers: the heavy bottom layer consists of an Al-Cu, Al-Fe, or Al-Zn alloy forming the anode; the electrolyte (intermediate layer) is composed of fluorides; the top layer consists of superpurity Al acting as cathode. Its density is 2.3 g per cc. at the working temperature of the cell (1365 F or 740 C). A number of these cells are arranged in series and connected to an electric generator. As the current flows the Al is transferred from the impure anode metal below, through the electrolyte to the cathode where it collects as a pure liquid. With such a cell, metal of 99.990 to 99.998% purity can be produced and 99.999% if special precautions are taken.

16469 New Magnesium Alloys for High Temperature. T. E. Leontis. *Metal Progress*, v. 72, Aug. 1957, p. 97-103.

Addition of Th up to 4% produces Mg castings, sheet, and extrusions of superior short-time tensile properties up to 800 or 900 F, markedly better creep resistance up to 700 F, and raises the temperature limit of utility above 600 F as well as extends the range of applications in the 300 to 500 F range.

16470* Electrical Contact Materials for Light Duty Applications. Effects of Oxide Films on Performance. L. B. Hunt. *Platinum Metals Review*, v. 1, July 1957, p. 74-81.

Properties of Pt metals and their alloys. Effects of oxide films on performance.

16471 The Strengthening of Thorium by Alloying, Heat Treatment, and Cold Work. H. R. Ogden, R. M. Goldhoff, and R. I. Jaffee. Paper from "Problems in Nuclear Engineering", v. I. p. 200-206. 1957. Pergamon Press. (TK9006 En34s Over.)

Carbon as an impurity element, was shown to be the chief contributor to the strength differential between bomb-reduced and high-purity Th. Thorium-carbon alloys can be heat treated to high strength levels by a precipitation-hardening process and by cold working. Combinations of cold working followed by aging provide optimum properties in Th-C alloys.

16472 Low-Nickel, Austenitic Stainless Steels. L. F. Spencer. *Product Engineering*, v. 28, Aug. 1957, p. 135-140.

Replacement of 18-8 steels with "200" series stainless based on corrosion, fabrication, forming, and welding problems.

16473 Tool Steels. Selection of Materials for Hot Work Applications. IV. L. F. Spencer. *Steel Processing and Conversion*, v. 43, Aug. 1957, p. 447 + 10 pages.

16474 Transactions of American Society for Metals. Ray T. Bayless, editor. v. XLIX. 1031 p. 1957. American Society for Metals, Cleveland. (TS300 Am35t Vis.)

This volume is a compilation of 44 papers presented at the Thirty-Eighth Annual Convention of the Society.

16475 A Study of the Air Contamination of Three Titanium Alloys. J. E. Reynolds, H. R. Ogden, and R. I. Jaffee. Paper from "Transactions of American Society for Metals". v. XLIX. 1957. p. 280-299. (TS300 Am35t Vis.)

The air contamination of commercial Ti, Ti-5Al-2.5Sn, and Ti-4Al-4Mn alloys was studied over a temperature range of 815 to 1149 C. A Van Ostrand-Dewey diffusion analysis was applied to hardness-penetration curves and diffusion coefficients associated with the contamination process were calculated.

16476 (French.) Use of Radioisotopes in Studies of the Preparation of High Purity Aluminum and Iron. **Application des radioéléments a l'étude de la purification très poussée de l'aluminium et du fer.** These Presented to the Science Department of the University of Paris for a Degree of Doctor of Physical Sciences. **Thèses présentées a la faculté des sciences de l'université de paris pour obtenir le grade de docteur ès sciences physiques.** Philippe Albert. 72 p. 1956. Masson et Cie, Editeurs, Libraires de l'Academie de Medecine, Paris. (TN673 AL14a)

Importance played by impurities in various branches of metallurgy. New methods for the determination of small traces of impurities rendered necessary by new theories of structural defects involving interaction between crystals and extraneous atoms. Radioelements were used in analyzing pure Al and Fe. Principles of systematic analysis after irradiation in a beam of elementary particles. High purity Al and Fe were analyzed after irradiation in an atomic pile. Recrystallization of Al after cold hammering. Determination and elimination of C traces in pure Fe.

16477 Resume of Uranium Alloy Data. XII. E. F. Losco, J. Belle, E. K. Halteman, and L. J. Jones. *Westinghouse Electric Corporation, Atomic Power Division (U. S. Atomic Energy Commission)*, WAPD-PWR-PMM-625, May 1956, 57 p. (UF767 Un3.1wa Contin.)

16478* (German.) Contributions to the Knowledge of the Gas Content of Lead. **Beiträge zur Kenntnis des Gasgehaltes von Blei.** Wilhelm Hofmann and Jürgen Maatsch. *Zeitschrift für Erzbergbau und Metallhüttenwesen*, v. 10, July 1957, p. 313-317.

Determination of CO_2 and H_2O, solubility of H, and effects of gases on properties.

16479* (German.) Processing Copper-Containing Scrap Metals. **Verarbeitung von kupferhaltigen Altmetallen.** Wilhelm F. Kaiser. *Zeitschrift für Metallkunde*, v. 48, July 1957, p. 404-409.

See also: **16095** (properties and application of Al); **16259** (Ti in the food industry).

METALS—CORROSION

16480* (German.) Testing Welded and Unwelded Austenitic Chromium-Nickel-Steels for Intercrystalline Corrosion. **Prüfung geschweisster und ungeschweisster austenitischer Chrom-Nickel-Stähle auf interkristalline Korrosion.** Herbert Zitter. *Archiv für das Eisenhüttenwesen*, v. 28, July 1957, p. 401-416.

Comparison of various testing methods. Isothermic segregation characteristics of grain boundary carbides. Differences in testing in various acid mixtures. Measuring thermal stress in welding. Comparison of energy distribution in welding ferritic and austenitic sheets. Comparison of segregation characteristics with welding requirements.

16481* (Polish.) Studies on the Mechanism of Sulfurization of Low-Percentage Copper-Aluminum Alloys. **Badania mechanizmu siarkowania niskoprocentowych stopów miedzi z glinem.** Lucjan Czerski, Stanislaw Mrowec, and Teodor Werber. *Archiwum Hutnictwa*, v. 2, no. 2, 1957, p. 183-202.

The scale on alloys of Cu with Al forms as a result of simultaneous and opposing processes of diffusion of Cu and S. The outer layer results from outward diffusion of Cu ions and the inner layer from inward diffusion of S.

16482* (Russian.) An Automatic Regulator for Cathodic Protection of Pipe Lines. **Avtomaticheskii reguliator zashchitnogo potentsiala dlia gazoprovodov.** V. I. Ivanenko and A. D. Pushchalovskii. *Avtomatika*, 1957, no. 1, Mar. 20, p. 18-26.

A constant potential may be attained only with the aid of an automatic regulator which continuously changes the resistance of the current circuit. The use of a thermogenerator as the source of d.c. is recommended.

16483 The Reaction of Steam With Uranium and With Various Uranium-Niobium-Zirconium Alloys at High Temperatures. Alexis W. Lemmon, Jr. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-1192, June 1957, 74 p. (UF767 U3.b Contin.)

Measurement of metal-water reaction rates; emissivity determinations.

16484 The Resistance of Non-Ferrous Metals to Corrosion in Buildings. F. E. Jones. *Chemistry & Industry*, 1957, no. 31, Aug. 3, p. 1050-1063.

A study of corrosion of Pb, Cu, Zn, and Al as used in construction applications.

16485 Corrosion of Metals in Buildings. The Corrosion of Ferrous Metals in Buildings. J. C. Hudson and F. Wormwell. *Chemistry & Industry*, 1957, no. 32, Aug. 10, p. 1078-1089.

Prevention of corrosion depends on good design and thorough protection. Several cases are studied.

16486 Cathodic Protection of Oil Well Casings at Kettleman Hills, Calif. James K. Ballou and Fred W. Schremp. *Corrosion*, v. 13, Aug. 1957, p. 507t-514t.

Tests showed that cathodic protection is a practical method of controlling external casing corrosion at least to depths of 8000 ft., provided sufficient current is used. Current densities on the order of 1.0 to 1.5 ma. per sq. ft. are believed necessary.

16487 The Application of Cable in Cathodic Protection. Maurice A. Riordan and Robert G. Fisher. *Corrosion*, v. 13, Aug. 1957, p. 519t-526t.

A method and charts that simplify selection of the economic optimum in cable size for specific operating conditions. A cable construction which makes use of a polyethylene insulation and a PVC sheathing compound has the best combination of properties.

16488 Some Aspects of the Corrosion Processes of Iron, Copper and Aluminum in Ethylene Glycol Coolant Fluids. P. F. Thompson and K. F. Lorking. *Corrosion*, v. 13, Aug. 1957, p. 531t-535t.

Corrosion potentials in glycol-water solutions. Effect of addition of triethanolamine phosphate on corrosion properties.

16489 Chloride and Caustic Stress Corrosion of Austenitic Stainless Steel in Hot Water and Steam. W. Lee Williams. *Corrosion*, v. 13, Aug. 1957, p. 539t-545t.

Stress corrosion from chlorides is dependent on O content, and prevention of damage from this source may be obtained by limiting either the chloride level or the O level. Stress corrosion from caustic solutions is not so well understood, but the maintenance of a proper phosphate-caustic ratio may be a suitable preventive measure.

16490* (French.) Corrosion of Lead Cases of Underground Electric Cables. **La corrosion des gaines de plomb dans les cables électriques souterrains.** J.-C. Senez and F. Pichinoty. *Corrosion et Anticorrosion*, v. 5, July-Aug. 1957, p. 203-209.

This corrosion is characterized by the formation of $2PbCO_3 \cdot Pb(OH)_2$ and $PbCO_3$ in variable proportions and is frequently due to attack on the Pb by volatile acids present in the form of esters in the raw jute. These esters are hydrolyzed in the cable by pectinolytic bacteria.

16491 Erosion of Aluminum. Edward H. Honeycutt, Jr. *E. I. du Pont de Nemours & Co., Savannah River Laboratory, Technical Division (U. S. Atomic Energy Commission)*, DP-214, May 1957, 16 p. (UF767 Un3.1dp Contin.)

Specimens of Al were undamaged or eroded only slightly during two months of exposure to deionized water at velocities up to 125 ft. per sec.

16492* (German.) Study of the Oxide Layers on Cast Iron and Aluminum. **Über Oxydschichten auf Eisen und Aluminium.** Anton Königer. *Giesserei*, v. 44, Aug. 1, 1957, p. 457-461.

Examination of the effect of the skin or oxide scale on the mechanism of corrosion. Gases as the source of swelling within the skin. Effect of local corrosion at the surface on the formation of blowholes. Prerequisites of the formation of a dense oxide skin. Fundamental differences in the corrosion behavior of cast iron and Al.

16493 Intergranular Corrosion of Aluminum in Superheated Steam. Cornelius Groot and R. E. Wilson. *Industrial and Engineering Chemistry*, v. 49, Aug. 1957, p. 1251-1254.

To investigate temperature and pressure limitations for Al used in high temperature, water-cooled reactors, intergranular corrosion for Al alloys M-388 and 1100 in superheated steam was studied. The long induction period was a function of both temperature and pressure, but once intergranular corrosion occurred, it often destroyed a sample in a few hr. Alloy M-388 was more resistant than 1100, the reactivity of which varied with lots and was correlated with Fe content. This type of corrosion for Al can be reduced by using M-388, or less effectively, by increasing Fe content of 1100.

16494 Corrosion Resistance of Copper and Copper Alloys. Arthur I. Heim. *Industrial and Engineering Chemistry*, v. 49, Aug. 1957, p. 63A + 2 pages.

A detailed guide to the resistance of Cu and its alloys to chemical reagents.

16495* An Experimental Study of Fretting. I-Ming Feng and B. G. Rightmire. *Institution of Mechanical Engineers, Proceedings*, v. 170, no. 34, 1956, p. 1055-1064 + 6 plates.

A new technique for visual examination of the progressive development of fretting is evolved and is found to be especially useful in following fretting from the initial stage to the later stages.

16496 Stress Corrosion of Austenitic Stainless Steels in Steam and Hot-Water Systems. C. Edeleanu and P. P. Snowden. *Iron and Steel Institute, Journal*, v. 186, Aug. 1957, p. 406-422.

Stress corrosion seems to occur only under pressure and temperature conditions which are consistent with the presence of a film of electrolyte on the steel surface, and only if certain impurities, such as chloride and caustic, are also present. In highly superheated steam, such as 600 C and 1500 lb/in^2, no stress-corrosion cracking was found. Provided the steel surface is clean, ordinary creep data should be applicable in steam, but premature failures are likely with steel contaminated with chlorides, due to an oxidation effect. At lower temperatures, and particularly below 400 C, stress corrosion can occur with 1500 lb/in^2 steam, but probably only if the steel is contaminated. The cracking with chloride contamination is rapid only near the dewpoint and is slow at 20 C superheat. At much higher superheat values it may not occur. With caustic contamination there is cracking even at high superheat values. Oxygen seems to be necessary for chloride cracking, but not for caustic cracking. All the conventional austenitic steel compositions are considered susceptible to stress corrosion under really bad conditions.

16497 The Corrosion of Tin and Tinned Copper in Dilute Neutral Solutions. S. C. Britton and D. G. Michael. *Journal of Applied Chemistry*, v. 7, July 1957, p. 349-356.

The occurrence of local corrosion of tin surfaces in dilute chloride solutions is not associated with surface conditions. Repeated removal of oxide from a tin surface at sufficiently frequent intervals prevents the development of local corrosion. The initiation of local corrosion is accelerated, and the number of points of attack is increased by: crevices produced by some surface defects and by contact with another solid surface, lowering the pH of the solution below four, and contact with a more noble metal such as Cu or Ni. Wiped coatings on Cu are more susceptible to local corrosion than electrodeposited or hot-dipped coatings since the surface presented to the corroding solution is a mixture of Sn and Sn-Cu compounds which form a galvanic couple. Alloying additions of Zn, P or In which improve the resistance of tin to dry oxidation, do not prevent local corrosion by chloride solutions. The addition of chromate, benzoate, bicarbonate, silicate, nitrite, or phosphate to chloride solutions in adequate amounts makes them non-corrosive to tin. The presence of bicarbonate in most supply waters probably restricts the number of occurrences of local corrosion. Local corrosion can be prevented by cathodic protection with Al anodes.

16498* (Russian.) The Catalytic Effect of Metals on the Corrosiveness of Motor Oils. **O kataliticheskom vliianii metallov na korrozionnuiu agressivnost' motornykh masel.** A. V. Druzhinina and G. S. Tarmanian. *Khimiia i Tekhnologiia Topliva, i Masel*, 1957, no. 7, July, p. 43-49.

A relation between catalytic effect of Cu on oil oxidizability and corrosiveness of oils in respect to Pb and anti-friction bearing platings from Pb and In. Anticorrosive additions forming a protective coating passivate the catalytic effect of metals on oil oxidizability and so protect the metal from corrosive effect of oil oxidation products.

16499 Corrosion of Aluminum in High Temperature Water. II. Application of Infrared Spectra to Corrosion Studies. R. M. Haag. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission)*, KAPL-1739, Feb. 1957, 19 p. (UF767 Un3.1ka Contin.)

Corrosion products may be identified *in situ* by reflectance measurements, or after removal from the base metal.

16500 Corrosion of Aluminum in High-Temperature Water. III. Inhibition of Corrosion by Sodium Silicate. R. M. Haag and F. C. Zyzes. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission)*, KAPL-1741, Feb. 1957, 18 p. (UF767 Un3.1Ka Contin.)

The corrosion rate of 2-S aluminum in high purity water and in 0.01, 0.1 and 1 wt % sodium silicate solutions was measured at 200 and 250 C. A marked inhibition of corrosion was observed in the more concentrated solutions.

16501 Effect of Welding Atmosphere and Pickling on the Corrosion Resistance of Welded Zircaloy-2 and -3. K. H. Koopman, W. S. Horton, A. B. Riedinger, S. A. Toftegaard, and A. P. Jordan. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission)*, KAPL-1811, Aug. 1957, 29 p. (UF767 Un3.1ka Contin.)

The best corrosion resistance was obtained with the highest purity gas shielding conditions. The effect of atmosphere was more pronounced in welds made with a high heat input and integral backing than in welds made at a low heat input. Repickling leads to no improvement in corrosion resistance.

16502* (Russian.) Electrode Potentials and Rate of Copper Oxidation in Aqueous Solutions of Chlorides of Alkali Metals and Alkaline Earth Metals. **Elektrodyne potentsialy i skorost' okisleniia medi v vodynkh rastvorakh khloridov shchelochnykh i shchelochnozemel'nykh metallov.** V. M. Kadek and L. K. Lepin'. *Latvijas PSR Zinātnu Akademijas, Vestis*, 1957, no. 5, p. 107-117.

Solutions of K, Na, Li, Mg, and Ca in concentrations from 0.001 *N* to saturation were used. Initial rate of corrosion on Cu is a maximum 2.6 mg. per sq. dm. in saturated KCl solution, and a minimum 0.30 mg. per sq. dm. in saturated $CaCl_2$ solution. Rate decreases with time and depends upon the oxidation product.

16503* (German.) The Attack of Liquid Zinc on Titanium. **Der Angriff von flüssigem Zink auf Titan.** K. Ruttewit and E. Eichmeyer. *Metall*, v. 11, Aug. 1957, p. 659-662.

Attack of liquid Zn on Ti is linearly proportional to time and temperature. Titanium loss is appreciable and dissolves completely after a few hr. at 600 C.

16504* The Testing and Examination of Electrodeposits. III. Salt Spray Testing. R. Quarendon. *Product Finishing*, v. 10, Aug. 1957, p. 62-71.

Immersion tests; assessing results; applications and shortcomings; operational techniques; A.R.E. and intermittent spray tests; spray solutions; "Corrodkote" and SO_2 tests.

16505 (French.) Role of Surface State and Structure in Stainless Steel Activity. **Rôle de l'état de surface et de la structure sur l'activité des aciers inoxydables.** Theses Presented to the Science Department of the University of Paris for the Degree of Doctor of Engineering. **Thèses présentées a la faculté des sciences de l'université de paris pour obtenir le titre d'ingenieur-docteur.** Henri Hatwell. 27 p. 1956. La Revue de Metallurgie, Paris. (TN757.C5 H28r Over.)

Role of O absorbed on the surface of Fe-Cr alloys in passivity phenomena. Study of selective corrosion of stainless steels with reference to Fe-Cr-Ni alloy with 25% Cr and 20% Ni and an industrial steel of the 18/8 Mo type. Honeycomb corrosion. Rate of anodic dissolution of Fe-Cr alloys as a function of the Cr content in a 10% oxalic acid solution.

16506 Corrosion Resistance of No. 20 and No. 20Cb Stainless-Steel Welds. Hallock C. Campbell, Thomas J. Moore, and S. E. Tyson. *Welding Journal*, v. 36, Aug. 1957, p. 353s-359s.

Both types become highly susceptible to intergranular corrosive attack after exposure to 1350 F for only two minutes. Annealing appears to be accomplished by heating to 1700 F for two hours, followed by a water quench. When there is danger of weld cracking, No. 20 electrodes should be used, but the vessel must be heat treated to prepare it for corrosive service.

16507* (German.) Description of the Corrosion Behavior of Aluminum and Its Alloys in Electrolytes by Means of Corrosion Current-pH Value Diagram. **Darstellung des korrosiven Verhaltens des Aluminiums und der Aluminium-Legierungen in Elektrolyten mittels des Korrosionsstrom-pH-Diagramms.** T. Markovic and U. M. Balasa. *Werkstoffe und Korrosion*, v. 8, July 1957, p. 402-405.

See also: **16034** (anti-corrosive pigments); **16049** (new corrosion resistant coatings); **16125** (events at a scratch-line); **16716** (corrosion of Zr); **16820** (irradiation on corrosion resistant fuel alloys); **16878** (corrosion and wear in water-cooled reactors).

METALS—EXTRACTION AND REFINING

16508 (German.) Salt Impregnation for the Linings of Aluminum Melting and Holding Furnaces. **Salzimprägnierverfahren für Zustellungen von Aluminium-Schmelzund Warmhalteöfen.** W. Helling and E. Kistermann. *Aluminium*, v. 33, Aug. 1957, p. 514-520.

Pores of the furnace masonry are sealed by melting a mixture of 80% NaCl and 20% cryolite in the furnace, thereby reducing the rate of its interaction with the metal.

16509* (German.) New Kind of Pig Mold and Its Transport. **Neuartiger Masselstapel und sein Transport.** P. Schmidt. *Aluminium*, v. 33, Aug. 1957, p. 523-524.

New form has close, two-way toothing which makes it easy to build up very stable stacks, with particularly efficient space utilization. The molds are built up on a support which is cast separately of the same alloy as the molds.

16510* (German.) The Influence of Catalysts on the Reduction of Iron Ores With Hydrogen. **Über den Einfluss von Katalysatoren auf die Reduktion von Eisenerzen mit Wasserstoff.** Willi Machu and Said Y. Ezz. *Archiv für das Eisenhüttenwesen*, v. 28, July 1957, p. 367-371.

Of 100 materials tested Cu, Ni, and Pt had a positive catalytic effect, but only in the temperature range 250-400 C.

16511 Production and Separation of U^{233}. Collected Papers. **I-II.** Leonard I. Katzin. *Argonne National Laboratory (U. S. Atomic Energy Commission)*, TID-5223, 1952, 728 p. (UF767 Un3ti Contin.)

The assembled record of significant work relating to U^{233} which was done on the Manhattan Project from 1942 through July 1, 1945.

16512 Continuous Casting of Steel, Studied With Radioisotopes. B. N. Katomin and V. S. Rutes. *Henry Brutcher Translation No.* 3944, 25 p. (From *Izvestiia Akademii Nauk SSSR, OTN*, no. 1, Jan. 1957, p. 123-135.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 8770, v. 6, June 1957.

16513 Experimental Electric Smelting of Ilmenite to Produce High-Titania Slag and Pig Iron. G. E. Viens, R. A. Campbell, and R. R. Rogers. *Canadian Mining and Metallurgical Bulletin*, v. 50, July 1957, p. 405-410; *Canadian Institute of Mining and Metallurgy, Transactions*, v. 60, 1957, p. 225-230.

Using a continuous, three-phase, experimental 250 kv.a. furnace, operated without a roof, it was shown that when slag having an average TiO_2 content of 71.4% was produced by the standard open-bath smelting of minus ¼ in. beneficiated ilmenite ore, serious losses of energy, reductant, and electrodes were experienced and the TiO_2 content of the slag had an average deviation of 6.1%. Slag having an average TiO_2 content of 71.5% may be produced by open-bath smelting (without a furnace roof) a briquetted mixture of reductant and minus 14 mesh beneficiated ilmenite ore, using asphalt as a binder. This slag showed 1.5% average deviation in TiO_2 content, indicating a more stable operation. Slag containing as high as 85% TiO_2 may be produced by the cold dry-top smelting of minus 14 mesh beneficiated ilmenite ore. Slag averaging 82.5% TiO_2 was produced over a period of 87 hrs., the average deviation being 1.2%. Energy, reductant, and electrode consumption were much lower, and the carbon content of the metal was considerably

higher, than in the aforementioned cases. The furnace charge was maintained at the low bulk density required for cold dry-top smelting by using wet bark from paper-mill operations as part of the reductant. The high TiO_2 content of the slag (up to 85%) should make it particularly attractive for the production of $TiCl_4$.

16514* (Italian.) Induction Smelting Furnaces With Industrial Frequency. **Forni di fusione ad induzione, a frequenza industriale.** Lelio Orsini. *Fonderia*, v. 6, June 1957, p. 269 + 2 pages.

Operation, use, and properties of induction furnaces.

16515* (Czech.) Advantages of Automatic Flame Reversal in Open-Hearth Furnaces. **Výhody automatické reversace plamene u martinových pecí.** Václav Parma. *Hutnické Listy*, v. 12, July 1957, p. 578-585.

The principle of flame reversal and individual systems of automatic reversal. Furnace operation is simplified and the work improved.

16516* (Czech.) Application of Chromic Ore Instead of Ferrochrome in Steel Industry. **Používání chromové rudy místo ferrochromu při výrobě oceli.** Vladimír Keclík. *Hutník*, v. 7, July 1957, p. 221-226.

Russian and Czech experience in the application of chromic ore in open-hearth and electric arc furnaces. Procedure and results of test meltings.

16517 The Changing Open Hearth Picture. Kenneth C. McCutcheon. *Industrial Heating*, v. 24, Aug. 1957, p. 1571 + 6 pages.

Numerous means of increasing capacities of existing open-hearth facilities provide margin for economy. New open-hearth installations are larger. The choice of process for future steel making will be dependent upon individual circumstances.

16518 The Liquidus and High-Temperature Properties of Blast-Furnace Slags. B. G. Baldwin. *Iron and Steel Institute, Journal*, v. 186, Aug. 1957, p. 388-395.

16519 Heat Flow in Ingot Hot-Tops. G. Fenton. *Iron and Steel Institute, Journal*, v. 186, Aug. 1957, p. 396-405.

Heat content of the refractory accounts for most of the heat loss, so that the vital property of any hot-top tile is its thermal capacity rather than its conductivity. Heat losses from the top surface and to the ingot, although of minor significance, become more and more important as head size increases.

16520 Economics of Continuous Casting in a Converter Steel Plant. J. Savage and J. S. Morton. *Journal of Metals*, v. 9, Aug. 1957, p. 1052-1056.

The range of application of continuous casting are assessed; recommendations based on practical experience and achievements of the past ten years.

16521 Continuous Casting of Three Types of Low Carbon Steel. F. G. Jaicks, J. E. Kraay, and M. Tenenbaum. *Journal of Metals*, v. 9; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Aug. 1957, p. 1057-1072.

Results obtained in tests on a continuous casting facility operated in conjunction with electric furnaces.

16522* (Italian.) Use of Spectrograph for Blast Furnace Control. **Lo spettrografo al servizio del controllo dell'alto forno. I.** Analysis of Slag and Sintered Ore. **Analisi delle scorie e dell' agglomerato d'altoforno.** Bruno Sommacal and Antonio Porta. *Metallurgia Italiana*, v. 49, June 1957, p. 449-456.

Both methods use d.c. arc excitation and superimposed exposures. The sample of sintered ore is mixed with graphite and inserted in the hole of an electrode, using as an internal standard the chemically determined Fe of the sample.

16523* (German.) The Influence of Hydrogen Additions to the Reduction Gas on the Increase of the Degree of Reduction of Indigenous Iron Ores. **Der Einfluss von Wasserstoffzusatz zum Reduktionsgas auf die Erhöhung des Reduktionsgrades einheimischer Eisenerze.** Horst Braun and Kurt Wachtl. *Neue Hütte*, v. 2, June 1957, p. 333-340.

Softening points in air and in reducing gas flow. Gases used in the test; working of the test; sampling. Determination of the degree of reduction; test data and their analysis. Comparison of the values calculated; critical consideration of the thermodynamic calculation. Effects upon blast furnace operation.

16524 Refining of Uranium. Bernhard Blumenthal. *Nuclear Science and Engineering*, v. 2, July 1957, p. 407-426.

Vacuum melting and liquation techniques are applied to remove or control contaminants.

16525 Design and Cost Estimate for a Pyrometallurgical Reprocessing Plant. Louis Basel and Joseph Koslov. *Nucleonics*, v. 15, Aug. 1957, p. 56-60.

Plant, using the oxide-slagging method, can handle 18,000 kg. per yr. of enriched U alloy at $79 per kg. The highly radioactive product requires remote refabrication.

16526 Status of the Hermex Process. O. C. Dean, E. Sturch, B. H. Morrison, and R. E. Blanco. *Oak Ridge National Laboratory (U. S. tomic Energy Commission)*, ORNL-2242, Aug. 1957, 31 p. (UF767 U3o Contin.)

The feasibility of a continuous method for recovery of U was demonstrated on a 20- to 20-g day basis, and larger-scale stainless steel equipment was constructed.

16527* (Polish.) Effect of Deoxidation by Silico-Manganese of Optimum Composition on Steel Properties. **Wpływ odtleniania stali krzemomanganem o optymalnym składzie na jej własności.** W. A. Mczedliszwili and A. M. Samarin. *Prace Instytutów Ministerstwa Hutnictwa*, v. 9, no. 3, 1957, p. 93-124.

Use of silico Mn in the ratio Mn:Si=3.5 or 4.5 results in a very small decrease in amount of inclusions, but a radical drop occurs when the ratio is 6 or 7. Main factors determining amount of inclusions and of O content are the fluidity and melting temperature of deoxidation products, which determine their coalescence. The most fluid products result from a Mn:Si ratio of 6. At this composition elasticity is also improved.

16528* (German.) The Dephosphorization of Basic Converter Steel to Very Low Contents of Phosphorus. **Die Feinentphosphorung von Thomasstahl.** Hans Kosmider and Hermann Schenck. *Stahl und Eisen*, v. 77, July 11, 1957, p. 917-926.

Effect of a high lime addition in obtaining a very low content of phosphorus in the steel. Mn, S, and N movement during the dephosphorization to low contents of P.

16529* (German.) The Use of Oxygen in Refining Pig Iron. **Die Verwendung von Sauerstoff zum Frischen von Roheisen.** Walter Bading. *Stahl und Eisen*, v. 77, July 11, 1957, p. 926-931.

Official regulations regarding the speed of flow and the O pressure. Safety of operation in the application of pure O to the process of blowing O onto the surface of the steel bath. Precautionary measures in installing the pipes and in the operation of the plant. Incorporation accident prevention device.

16530* (Russian.) Increasing Metal Yield by Heating of Hot Tops. **Povyshenie vykhoda godnogo putem obogreva pribyl'noi chasti slitka.** N. P. Zhetvin, A. A. Lebed'kov, V. P. Tunkov, and A. D. Zaitseva. *Stal'*, v. 17, July 1957, p. 587-592.

Utilization of the relatively simple and efficient methods of intensive heating of ingot and shaped casting hot tops makes possible a considerable reduction of the weight of ingot heads and an increase of the metal yield.

16531* (Russian.) Analog and Regulating Computers for Electric Arc Steel Furnaces. **Modeliruiushchie i reguliruiushchie vychislitil'nye ustroistva dlia dugovykh staleplavil'nykh pechei.** Iu. E. Efroimovich. *Stal'*, v. 17, July 1957, p. 602-608.

Development of methods for ruglation of power consumption and controlling electrical parameters of electric arc steel furnaces using computers and automatic analog devices will permit imrovement in the technical and economical indexes of furnace performance and quality of steel.

16532 Maintenance of Equilibrium in Blast Furnace Operation. II. Charles A. Agnew. *Steel*, v. 141, Aug. 5, 1957, p. 96 + 4 pages.

16533* (Russian.) Effects of Tin Slag Constituents on Slag Viscosity and Electric Conductivity. **O vliianii komponentov oloviannykh shlakov na ikh viazkost' i elektroprovodnost'.** V. V. Pokrovskii. *Tsvetnye Metally*, v. 30, no. 7, July 1957, p. 35-42.

Chemical composition of the slags (SiO_2, CaO, Al_2O_3, FeO, Sn plus MgO, and WO_3). Apparatus for simultaneous determination of viscosity and electric conductivity of slags. Effect of SiO_2, CaO, or FeO on specific electric conductivity.

See also: **16053** (continuous casting centralized control); **16144** (anodic effect in electrolitic Al); **16693** (Cu-slag reactions).

METALS—FINISHING, POLISHING, AND CLEANING

16534 Polarization Measurements for Improved Pickling Practices in Steel Industry. K. H. Brakstad. *Henry Brutcher Translation No.* 3907, 10 p. (From *Jernkontorets Annaler*, v. 140, no. 7, 1956, p. 512-519.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 14704, v. 5, Nov. 1956.

16535* Surface Examination by Radiation. A. E. Williams. *Industrial Finishing (London)*, v. 9, July 1957, p. 685 + 4 p.

16536 Selecting Mechanical Finishes for Aluminum. R. V. Vanden Berg. *Materials in Design Engineering*, v. 46, Aug. 1957, p. 102-106.

Data on type of finish, methods, advantages, and limitations.

16537 Barrel Finishing. Arthur S. Kohler. *Metal Finishing*, v. 55, Aug. 1957, p. 58-64.

Description of the elements of the operation and nomenclature. (To be continued.)

16538* (German.) Centrifugal Polishing—A New Polishing Method. **Zentrifugalpolieren—eine neue Poliermethodik.** E. Knuth-Winterfeldt and Ulf Langer. *Metalloberfläche*, v. 11, Aug. 1957, p. 253-254.

Preliminary studies on the chemical polishing of steel in an oxalic acid-hydrogen peroxide bath, centrifuged to about 175 G's. Advantages: quicker polishing, lower temperature, and reduced pit formation.

16539 (German.) Testing Problems of Technical Surfaces. **Prüfen und Messen technischer Oberflächen.** A. Wiemer and R. Lehmann. *Technik*, v. 12, July 1957, p. 477-483.

Deviations from the geometrical surface. Relative value system of a surface section. Roughness of the surface according to the type of work; boring, polishing, smelting, or rolling. Characteristics of the surface quality.

16540* Stress-Free Plating Salvages Valuable Jet Engine Parts. Edward Calderon. *Western Metals*, v. 15, Aug. 1957, p. 58-59.

Nickel deposits from a nickel sulfamate electrolyte.

16541* (German.) Oxide Formation of Inert Metals During Cathodic Sputtering. **Über die Oxydbildung von Edelmetallen bei Kathodenzerstäubung.** Tadasu Suzuki. *Zeitschrift für Naturforschung*, v. 12a, June 1957, p. 497-499 + 2 plates.

Cathodic sputtering of Ag, Au, and Pt at a pressure of five atm.; studied by electron interference.

See also: **16124** (Ni plate adhesion to steel); **16134** (ultrasonic cleaning); **16632** (surface treatment of tungsten).

METALS—FOUNDRY PRACTICE

16542 Design Changes Less Costly With Plastics Patterns. M. Ehrman. *Automotive Industries*, v. 117, Aug. 15, 1957, p. 58-61.

Where form is intricate, epoxy-plastic patterns have a cost advantage.

16543* The Carbon-Dioxide Process. G. E. Parramore. *British Foundryman*, v. 50, pt. 7, July 1957, p. 359-371.

Details are given of tests carried out to investigate the thermal properties of CO_2 process sand, dry sand, oil sand, and green sand containing 5.5% moisture.

16544 Study of Desulfurization of Cupola Iron With Magnesium (in Ladle). V. I. Lakomskii. *Henry Brutcher Translation No.* 3946, 9 p. (From *Liteinoe Proizvodstvo*, no. 1, Jan. 1957, p. 9-11.) Henry Brutcher, Altadena, Calif.

This is a reaction-rate-controlled (not diffusion-controlled) reaction and is practically irreversible.

16545* (Italian.) The Best Use of the Cupola Furnace With Special Regards to Recent Technical Improvements and Practical Applications. **L'impiego e la migliore utilizzazione del cubilotto con particolare riguardo a recenti sviluppi tecnici ed applicazioni pratiche.** Luciano Oltrasi. *Fonderia*, v. 6, June 1957, p. 247-259.

Historical development of the cupola furnace, combustion processes and reactions in normal cold blast furnaces, description of furnaces with different air cooling systems, and basic operation or duplex fusion systems.

16546* (Italian.) Regeneration and Disintegration of Molding Sands. **Rigenerazione e disintegrazione delle terre e sabbie da fonderia.** Ermes Dall'oglio and Francesco Carcano. *Fonderia*, v. 6, July 1957, p. 307-310.

Regeneration and disintegration of molding sands for economy in foundry practice. Wet and dry methods. Applications.

16547* (Italian.) The Cupola Furnace in Foundry. Theoretical Considerations and Practical Results. **Il cubilotto metallurgico in fonderia. Considerazioni teoriche e risultati pratici.** *Fonderia*, v. 6, July 1957, p. 323 + 5 pages.

Cold blast furnace, testing the shaft, the zone above the tuyères and below the tuyères. Reduction of iron oxides. Carbon absorption. Applications.

16548* (French.) Hot-Blast Cupola Furnace. A New and Simple Method of Heat Recovery to Warm the Blast in a Cupola Furnace. **Cubilot a vent chaud. Une méthode nouvelle et simple de récupération de la chaleur pour le chauffage du vent au cubilot.** Georges Ulmer. *Fonderie*, 1957, no. 138, July, p. 287-302.

Survey of the literature. New apparatus on small experimental cupola perimts pre-heating the blast to about 400 C. Description of installation and evaluation of results.

16549* (French.) A Model for Research on the Factors Influencing Foundry Production. Application of the Statistical Method. **Exemple de recherche de l'influence des facteurs de fabrication. Application des méthodes statistiques.** Jean Gélain. *Fonderie*, 1957, no. 138, July, p. 316-321.

Illustration of the use of the statistical method, as opposed to the classical method of holding all factors constant except the one to be studied, of isolating and evaluating factors in production.

16550 How to Use Olivine Sand. W. A. Snyder. *Foundry*, v. 85, Sept. 1957, p. 100-105.

Results of experimental work using olivine sand for molds, cores, ladle linings, and washes.

16551 Hot Cracks and Tears in Malleable Iron Castings. R. W. Heine and F. W. Jacobs. *Foundry*, v. 85, Sept. 1957, p. 120-125.

Tears or cracks form from microscopic separations due to restraint. Five general classes of variables may combine with normal contraction to cause tears or cracks. Except for casting design problems the variables are within the control of foundrymen.

16552 Founding of Magnesium. E. F. Emley. *Foundry Trade Journal*, v. 103, July 18, 1957, p. 63-70.

Sand casting; gravity- and pressure-die-casting; advantages and typical applications of Mg-alloy castings.

16553 Wax Models for Use in the Investment-Casting Process. E. H. G. Sargent. *Foundry Trade Journal*, v. 103, Aug. 1, 1957, p. 123-131.

Historical review of properties and uses of ancient and present-day formulations.

16554 Metallurgical Aspects of the Control of Quality in Non-Ferrous Castings. *Foundry Trade Journal*, v. 103, Aug. 8, 1957, p. 155-163.

A review of 7 papers presented at 1957 Spring Meeting, Institute of Metals, London.

16555* (German.) A New Process of Chilling the Surfaces of Castings in the Mold. **Ein neues Verfahren zum Abschrecken von Flächen an Gussstücken in der Form.** Erwin Knipp. *Giesserei*, v. 44, Aug. 1, 1957, p. 467-469.

Chilling with chill-molds and link chains.

16556* (German.) The Cronin Molding Process in the Steel Foundries of the German Democratic Republic. **Formmaskenguss nach Croning in den Stahlgiessereien der Deutschen Demokratischen Republik.** Hans Woykoss. *Giessereitechnik*, v. 3, June 1957, p. 123-126.

Advantages of and initial experience with the introduction of the Cronin molding process in East Germany.

16557* (German.) Production of Metallurgical Rollers From Mg-Treated Cast Iron. **Die Erzeugung metallurgischer Walzen aus Mg-behandeltem Gusseisen.** Friedrich Reinshagen and Werner Findeisen. *Giessereitechnik*, v. 3, July 1957, p. 145-151.

Pointers for the use of cast iron with nodular graphite for the manufacture of metallurgical rollers.

16558 Mold Treatment: The Key to Quality Castings. Hurbert Chappie. *Iron Age*, v. 180, Aug. 15, 1957, p. 98-101.

Description of mold preparation; effect of moisture and drying time on mold properties; effects of tapping temperature and pouring time.

16559 Investment Casting Defects. A. Hegarty. *Iron & Steel*, v. 30, Aug. 1957, p. 411 + 3 pages.

Dip-coat spalling; dip-coat buckling; excess metal bubbles; investment-trapped liquid; binder penetration; gas defects; hot metal; oxide fold; misrun or cold shut; and mold crack are considered.

16560 Ethyl Silicate Moulds. A. Torry. *Iron & Steel*, v. 30, Aug. 1957, p. 414-418.

New moulding and casting techniques developed; products manufactured with new processes have superior surface finish, closer dimensional accuracy and improved metal density.

16561 Design of Die-Castings. I. The Scope of the Die-Casting Process. H. K. Barton. *Metal Industry*, v. 91, July 19, 1957, p. 43-45.

Magnesium and Cu-base alloys are studied. (To be concluded.)

16562* (German.) Choice of Alloys for Pressure Casting. **Ligierungsauswahl für Druckguss.** W. Wolf. *Metall*, v. 11, Aug. 1957, p. 655-659.

Comparison of casting and mechanical properties of some alloys used in pressure casting.

16563 R_x for Swollen Gray Iron Castings. J. F. Wallace and E. B. Evans. *Modern Castings*, v. 32, Sept. 1957, p. 47-49.

Green sand movement; molding sand influences; graphite carbon influence; calculating volume changes; control of mold wall movement.

16564* (Polish.) Molding With a Sand Slinger. **O formowaniu narzucarka.** Jerzy Lempicki. *Przeglad Odlewnictwa*, v. 7, July 1957, p. 185-192.

Construction of patterns and molding boxes; influence of various agents on the density ratio of molding sands; properties of mixture densified by a slinger.

16565 Look to Aluminum Diecastings When Parts Must Be Light and Strong, Pressure Tight, and Intricate. *Steel*, v. 141, Aug. 5, 1957, p. 89-92.

See also: **15674** (life of foundry-furnace lining); **16427** (design of castings); **16462** (ferritic nodular iron quality control); **16508** (Al melting furnace lining); **17096** (foundry safety procedures).

METALS—HEAT TREATMENT

16566 (English.) **Grain Boundary Melting.** F. Weinberg and E. Teghtsoonian. *Acta Metallurgica*, v. 5, Aug. 1957, p. 455-464.

The melting behavior of tin grain boundaries has been examined as a function of stress, heating rate, boundary angle, and impurity concentration. Crystals with small-angle boundaries have no tendency to part at the boundary during melting whereas specimens with large-angle boundaries were consistently observed to separate. The temperature at which the separation took place was the same as the melting temperature of the bulk material within the experimental accuracy of 0.02 C. Impurities added to the material affected the melting temperature of the boundary as was expected from their phase diagrams. Similar tests were conducted using Al bicrystals, with corresponding results being noted.

16567 New Methods of Heat Treatment and Surface Impregnation of Metals in Fused Salts. A. I. Zot'ev. *Henry Brutcher Translation No.* 3955, 18 p. (From *Vestnik Mashinostroeniia*, v. 35, no. 5, 1955, p. 67-71.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 10554, v. 4, Aug. 1955.

16568* (Czech.) Annealing of Strips for Dual-Rolling of Aluminum Foils. **Popouštění pásů pro dvojité válcování hliníkové folie.** Stanislav Němeček. *Hutník*, v. 7, July 1957, p. 231-234.

Describes the old and new methods of annealing and further factors affecting texture development during dual-rolling. Rolling before annealing; cleanliness of cleaning felt; roller temperature and surface.

16569* (Czech.) High Speed Heating of Steel and Heating in a Salt Bath for Forging. **Rychlý kovářský ohřev oceli a ohřev v solné lázni.** Stanislav Hájek. *Hutník*, v. 7, July 1957, p. 234-236.

Regular method of heating for forging and the factors affecting its quality. High speed heating and its importance in mass production. The salt bath, its construction and use in high speed heating for forging.

16570* Quenching Oils. *Mechanical World and Engineering Record*, v. 137, Aug. 1957, p. 372-373.

Quenching media used in heat-treatment processes have an important influence on metallurgical results.

16571* (Russian.) Schemes of Carbide Formation During Tempering of Carbon Steel. **O skhemakh karbidvoobrazovaniia pri otpuske uglerodistoi stali.** B. A. Apaev. *Metallovedenie i Obrabotka Metallov*, 1957, no. 7, July, p. 23-24.

Diagrams show stability of carbide phases in various temperature regions and the change of the phase content of a given steel during a gradual increase of tempering temperature.

16572* (Russian.) High Speed Thin Layer Carbonitriding by Heating With High-Frequency Current. **Skorostnoe tonkosloinoe tsianirovanie pri nagreve tokami vysokoi chastoty.** A. S. Barshcheva and V. S. Gnuchev. *Metallovedenie i Obrabotka Metallov*, 1957, no. 7, July, p. 48-50.

Carbonitriding of small parts to a depth less than 0.1 mm. using high-frequency current heating, carbonitriding by application of a paste, and carbonitriding in a molten salt bath (potassium ferrocyanide 90% + barium chloride 10%).

16573* (French.) Selection and Heat Treatment of Gear Steels. **Le choix des aciers pour engrenages et leurs traitements thermiques.** O. Pattermann. *Métallurgie et la Construction Mécanique*, v. 89, July 1957, p. 643 + 6 pages.

Tempering after case-hardening, annealing, and examples of heat treatment of gears in the U. S.

16574 The Mystery of Magnetic Annealing. J. J. Becker. *Metal Progress*, v. 72, Aug. 1957, p. 84-89.

Properties of some magnetic alloys are improved by annealing in a magnetic field. In age hardening alloys this may be due to growth of needle-like particles aligned by the magnetic field; in solid solutions "ordered" particles may grow in similar shapes, or atom-pairs may be aligned with the field.

16575 Annealing of Zinc Base Die Castings. W. B. Stephenson, Jr. *Metal Treating*, v. 8, July-Aug. 1957, p. 6 + 2 pages.

The heat treating of zinc base die castings can be of great assistance to the electroplater. Many types of surface blemishes can be eliminated by an annealing treatment.

16576* (German.) Experiments on the Normalization of Overheated Unalloyed Construction Steels by Single or Repeated Impulse Heating. **Versuche zur Normalisierung überhitzter unlegierter Baustähle durch einmalige und mehrfach wiederholte Stossglühung.** K. Wellinger and P. Rupp. *Schweissen und Schneiden*, v. 9, July 1957, p. 339-349.

Normalizing in the welding machine; effects of repeated heating; comparison of results.

See also: **16021** (carburizing); **16633** (heat treatment and magnetic properties of 2.5% Si steel); **16666** (cold treatment of steel); **16690** (carbide volume changes during tempering of steel); **16739** (heat treatment of powder metal parts); **16745** (nondestructive testing of carbide case depths).

METALS—MECHANICAL AND PHYSICAL PROPERTIES

16577 (English.) **Internal Friction of β Brass.** L. M. Clarebrough. *Acta Metallurgica*, v. 5, Aug. 1957, p. 413-426.

The internal friction of polycrystals and single crystals of β brass has been investigated by the method of L.F., free, torsional vibration. Six separate phenomena are observed as distinct relaxation peaks at approximately 70, 177, 190, 285, and 300 C and an increase in internal friction to very high values at temperatures close to the order-disorder transformation temperature. The peak at 70 C is unstable and decays with an activation energy of 15,000 cal/mole. This is considered to be due to stress-induced reorientation of Zn pairs made possible by an excess concentration of vacancies resulting from quenching, and that at 177 C to stress-induced reorientation of Cu pairs. From this the diffusion coefficients for Cu in β brass are calculated. The peak at 190 C is attributed to stress relaxation at β-γ interfaces and that at 285 C to stress relaxation at β-α interfaces. The peak at 300 C is attributed to stress relaxation by grain boundary slip. High internal friction at temperatures close to the order-disorder transformation temperature is in agreement with theoretical prediction.

16578 (English.) **X-Ray Study of the Plastic Deformation in Zinc Single Crystals.** C. T. Wei. *Acta Metallurgica*, v. 5, Aug. 1957, p. 435-442.

The X-ray pattern of the imperfection ring can be accounted for by no more than ten dislocation loops, possibly originating from a single source. Some possible mechanisms for the formation of the observed band-like structures from the rings are discussed.

16579 How to Apply Hardness Testing in the Shop. Vincent E. Lysaght. *American Machinist*, v. 101, Aug. 12, 1957, p. 133-140.

Types of testers and their use.

16580 Effects of Alloying Element Additions of Molybdenum, Silicon, Aluminium, Titanium, Vanadium, and Niobium on the Thermal Cycling Stability of Uranium. S. T. Zegler and H. H. Chiswik. *American Society of Mechanical Engineers, Paper No.* 57-NESC-14, 1957, 10 p. (Tg1 Am35p Contin.)

16581 Multi-Band Electrical Conduction. John Browning Gibson and Joseph M. Keller. *Ames Laboratory (U. S. Atomic Energy Commission)*, ISC-687, Aug. 1955, 47 p. (UF767 Un3.lis Contin.)

Scattering amplitudes arising from lattice vibrations are calculated for electrons in a transition metal, with special reference to nickel.

16582* (German.) Optical Absorption, Photoelectrical and Thermal Emission, and the Relationship of Conductivity to Temperature of Cesium-Bismuth Sheets of Various Compositions. **Die optische Absorption, die photoelektrische und thermische Emission und die Temperaturabhängigkeit der Leitfähigkeit von Caesium-Wismut-Schichten verschiedener Zusammensetzung.** H. G. Clerc and G. Wallis. *Annalen der Physik*, v. 19, nos. 6-8, 1957, p. 344-352.

16583* Hall Coefficient of Technically Pure Metals From 80°K to 800°K. I. Results for Cu, Ag, Au, Pd, and Pt. V. Frank. *Applied Scientific Research*, v. 6, sec. B, no. 5, 1957, p. 379-387.

The coefficients of Cu, Ag, and Au are very similar in their temperature dependence, exhibiting (numerically) a flat minimum at ca. 200 K, a slow rise at high temperatures and a more rapid rise at low temperatures. For Pd and Pt a sharp minimum is found and the variation on the high temperature side is strong.

16584* (German.) Contribution to a Test Indication of the Cold Stamping Properties of Tool Steels. **Beitrag zur prüftechnischen Kennzeichnung der Kalteinsenkbarkeit von Werkzeugstählen.** Karl Bungardt and Otto Mülders. *Archiv für das Eisenhüttenwesen*, v. 28, July 1957, p. 383-395.

Experiments on unalloyed steel with 1% C, regarding relationships between stamping pressure, stamping depth, and specimen size. Calculation of stamping depth load curves, deformation resistance, and contraction fractures for six unalloyed and three alloyed steels. Influence of grain size, amount of forging, flow lines, and thermal treatment on deformation resistance.

16585* (German.) Influence of Crystal Orientation on the Fatigue Strength of α-Iron Monocrystals. **Einfluss der Kristallorientierung auf die Wechselfestigkeit von α-Eisen Einkristallen.** Max Hempel, Albert Kochendörfer, and Emil Hillnhagen. *Archiv für das Eisenhüttenwesen*, v. 28, July 1957, p. 417-422.

Preparation of α-iron monocrystals, X-ray orientation analysis, and tensile and fatigue strength tests. Wöhler curves for mono- and multi-crystalline soft iron with 0.006% C. Relationships between alternating bending and static strength. Influence and effect of crystal orientation and position of grain boundaries on fatigue strength.

16586 Effects of Complex Stress-Time Cycles on the Fatigue Properties of Metals. W. L. Starkey and S. M. Marco. *ASME, Transactions*, v. 79, Aug. 1957, p. 1329-1336.

Four theoretical design methods and the results of an experimental investigation involving complex stresses.

16587 Fatigue of Metals Under Combinations of Stresses. W. N. Findley. *ASME, Transactions*, v. 79, Aug. 1957, p. 1337-1348.

Several theories of failure under combined stress are examined and modified to account for observed facts. A general design expression is proposed.

16588 Atomic Structure and the Strength of Metals. N. F. Mott. 64 p. 1956. Pergamon Press, New York. (TN690 M85a)

A nontechnical account of recent researches aimed at understanding why metals have their characteristic strength and ductility.

16589* Observations on the Stress-Strain Behaviour of a Series of Unalloyed High-Duty Pearlitic Irons of the Inoculated Type. H. K. Lloyd and J. V. Harding. *British Foundryman*, v. 50, pt. 7, July 1957, p. 352-358.

The relationship between the tensile strength and various elastic and plastic properties for these irons is shown. The effects of structure, mass effect, and rate of stressing on these properties are discussed.

16590 Mechanical Nature of Temper Brittleness. N. V. Tolstoguzov. *Henry Brutcher Translation No.* 3854, 6 p. (From *Metallovedenie i Obrabotka Metallov*, v. 2, no. 8, 1956, p. 28-30.) Henry Brutcher, Altadena, Calif.

Static tests on standard tensile specimens of cast Cr-Ni steels showed directly that temper brittleness is associated with a lowering of tensile strength.

16591 High-Temperature Fatigue Tests With Repeated or Cyclic Tensile Stressing. G. Vidal and P. Lanusse. *Henry Brutcher Translation No.* 3898, 16 p. (From *Recherche Aéronautique*, v. 43, May-June 1955, p. 45-51.) Henry Brutcher, Altadena, Calif.

Particulars on apparatus and its use.

16592 Effect of Hydrostatic Pressure Upon the Hardness of Carbon Steel. V. A. Gladkovskii. *Henry Brutcher Translation No.* 3941, 3 p. (From *Fizika Metallov i Metallovedenie*, v. 3, no. 1, 1956, p. 183-184.) Henry Brutcher, Altadena, Calif.

A relationship is established.

16593 Creep Resistance of Alloys as Function of Their Composition. A. A. Bochvar. *Henry Brutcher Translation No.* 3945, 8 p. (From *Izvestiia Akademii Nauk SSSR, OTN*, no. 1, Jan. 1957, p. 136-138.) Henry Brutcher, Altadena, Calif.

Resolves the theories attributing creep resistance to the formation of multicomponent solid solutions and to the formation of a multiphase structure.

16594 Study of Mechanism of Effect of Boron by the Internal-Friction Method. M. V. Pridantsev, O. N. Meshcherinova, and Iu. V. Piguzov. *Henry Brutcher Translation No.* 3953, 6 p. (From *Doklady Akademii Nauk SSSR*, v. 111, no. 1, 1956, p. 98-101.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 5855, v. 6, Apr. 1957.

16595 Discussion of the Electrical Properties of Compounds With the Nickel Arsenide Structure. W. B. Pearson. *Canadian Journal of Physics*, v. 35, Aug. 1957, p. 886-891.

A valence scheme is proposed for alloys such as CrSe, MnTe, and FeS, with the nickel arsenide structure, which indicates why they may be semiconductors, while chalcogenides of Co and Ni and antimonides and bismuthides of Cr, Mn, Fe, Co, and Ni with a similar structure are metallic.

16596 Low Temperature Resistivity of Transition Elements: Vanadium, Niobium, and Hafnium. G. K. White and S. B. Woods. *Canadian Journal of Physics*, v. 35, Aug. 1957, p. 892-900.

Measurements of the thermal conductivity from 2 to 90 K and electrical conductivity from 2 to 300 K are reported.

16597* (Spanish.) Fatigue and Design in Welded Naval Construction. **La fatiga y el proyecto en la construccion naval soldada.** Z. García Martín. *Ciencia y Técnica de la Soldadura*, v. 7, May-June 1957, 18 p.

Fatigue tests. Relationship between the mechanical properties and their fatigue resistance. Admissible tension and safety factor. Role of structure shape. Riveted and welded structures and fatigue stress.

16598* (French.) Diagrams of Tensile Strength Test on Copper With Constantly Increasing Stress. **Diagrammes de traction du cuivre par charge continûment croissante.** Georges Balasse and Richard Gaspard. *Comptes Rendus*, v. 245, July 29, 1957, p. 497-499.

The effect of the loading speed on the strength-elongation curves.

16599* (Russian.) Intergranular and Intragranular Nature of the Destruction of Armco Iron Due to Fatigue. **Mezhzerennyi i vnutrizerennyi kharakter razrusheniia armko zheleza pri ustalosti.** V. S. Ivanova. *Doklady Akademii Nauk SSSR*, v. 114, no. 3, May 21, 1957, p. 537-540.

With cyclic tensions exceeding the yield limit, the intergranular plasticity does not leave enough time for the granules to become strengthened. The process of diffusion of foreign atoms toward the grain edges is a determining factor.

16600 Brittle Fracture of Mild Steel in Torsion. J. B. Hunt. *Engineering*, v. 184, Aug. 9, 1957, p. 173-174.

Low-temperature impart tests. As brittle fracture conditions were approached, a uniform elasto-plastic twist existed and this twist became a maximum when the over-all ductility began to decrease. Torque-twist curves with a negative slope after yield were obtained.

16601* (Russian.) Electric and Magnetic Properties of the CdSb Intermetallic Compound. **Elektricheskie i magnitnye svoistva intermetallicheskogo soedineniia CdSb.** I. M. Pilat. *Fizika Metallov i Metallovedenie*, v. 4, no. 2, 1957, p. 232-238.

The electric, magnetic, and rectifying properties were tested in relation to the excess of Cd or Sb as well as in relation to the concentration of Al, Te, Pb, Sn, and In additions.

16602* (Russian.) The Effect of Elastic Stresses and Thermomechanical Treatment on the Magnetic Properties of Hard Magnetic Materials. **Vliianie uprugikh napriazhenii i termomekhanicheskoi obrabotki na magnitnye svoistva nekotorykh zhestkikh magnitnykh materialov.** M. G. Luzhinskaia and Ia. S. Shur. *Fizika Metallov i Metallovedenie*, v. 4, no. 2, 1957, p. 239-244.

16603* (Russian.) Study of the Coercivity of Cold-Strained and Tempered Ferroalloys. **Issledovanie koertsitivnoi sily kholodnodeformirovannykh i otozhzhennykh zheleznykh splavov.** G. M. Fedash. *Fizika Metallov i Metallovedenie*, v. 4, no. 2, 1957, p. 257-266.

Points to the presence of diffusion processes aiming at a separation of components that develop during the deformation and incomplete tempering of Fe-Mn and Fe-Ni alloys.

16604* (Russian.) The Relationship Between Temperature and Internal Friction of Certain Pure Metals. **Temperaturnaia zavisimost' vnutrennego treniia nekotorykh chistykh metallov.** V. S. Postnikov. *Fizika Metallov i Metallovedenie*, v. 4, no. 2, 1957, p. 344-351.

Temperature variation of internal friction of pure metals is explained in terms of the theory of relaxation phenomena.

16605 A General Method of Analysis of Primary Creep Data. K. R. Merckx. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-50363, May 1957, 21 p. (UF767 Un3.1hw Contin.)

The experimental results of creep tests run on alpha uranium are analyzed and formulated into a mathematical model for material behavior.

16606 The Internal Friction of Plastically Deformed Copper. A. S. Darling. *Institute of Metals, Journal*, v. 85, Aug. 1957, p. 489-505.

A torsion pendulum having a low background energy loss was used to investigate the effect of plastic deformation upon the internal friction of tough-pitch and high-purity Cu. Four specimens were examined. Three test-pieces were annealed for 2 hrs. at 300, 400, and 600 C, respectively. Heat-treatments were carried out in an atmosphere of oxygen-free nitrogen. The fourth test-piece was annealed for 16 hrs. at 850 C *in vacuo*. The results of grain-size determinations made on these control samples after heat-treatment are summarized. The internal friction induced by deformation rises to a maximum for shear strains in the range 0.002-0.06 radian, after which it decreases rapidly. The magnitude of these effects increases with the temperature at which the specimen has previously been annealed. Secondary maxima on the internal-friction/strain curves appear to be associated with the presence of recrystallization textures. Changes of elastic modulus accompany these internal-friction changes, but are not directly related to them. The magnitude of the effect does not depend upon the impurity level, but is related to the prior annealing temperature. The internal-friction effects induced by plastic deformation can be eliminated from tough-pitch Cu, and considerably reduced in high-purity Cu, by annealing at 160 C.

16607* An Experimental Study of High-Permeability Nickel-Iron Alloys. C. E. Richards, E. V. Walker, and A. C. Lynch. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, no. 16, July 1957, p. 343-358.

Factors which might influence either the ultimate electrical performance or the consistency of the metals were studied with particular reference to the 77/14/5/4 Ni-Fe-Cu-Mo alloy, using samples made by powder metallurgy. If high permeabilities are to be obtained the permissible tolerance on composition is quite small, the limit for Fe and Ni being only ± 0.2%. Any introduction of Si makes the alloy susceptible to damage by water vapor in the annealing atmosphere. The final anneal should not permit formation of oxides within the metal. This may require the use of very pure dry H during the annealing cycle. Precision alloys, being substantially free of reactive metals such as Mn, Mg, and Si, may be annealed in commercial H, provided it is essentially free from O and water vapor. With commercial alloys annealed at 1050 C there is little to gain from annealing over 3 hr.; precision alloys may continue to improve for 20 hr. An annealing temperature of 1150 C is better than 1050 C, but unless the atmosphere can be closely controlled, a higher annealing temperature will damage commercial metal. Cold-rolling did not seem to affect metal properties seriously, though a variety of roll diameters was used. Reduction between anneals should be by about 50%; overrolling is perhaps preferable to underrolling. Although strip can be rolled very thin without undue loss in permeability, magnetic

losses increase sharply with reduction in thickness, and with strip thinner than 25μ they become important. The metal should have a permeability of over 30,000 at thicknesses of 50μ or more and 25,000 at 12μ.

16608* A Method for the Precise Measurement of Permittivity of Sheet Specimens. A. C. Lynch. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, no. 16, July 1957, p. 359-362.

Specimen is inserted loosely in a prefabricated electrode assembly and capacitance measured. When the specimen is removed and electrode separation reduced until the system has the same capacitance as before, permittivity can be calculated without knowledge of electrode area or of the calibration of any capacitors.

16609* Tension and Torsion Properties of Some Metals Under Repeated Dynamic Loading (Impact). D. B. C. Taylor and A. Z. Tadros. *Institution of Mechanical Engineers, Proceedings*, v. 170, no. 33, 1956, p. 1039-1054 + 5 plates.

Two new machines for the testing of metals to fracture under repeated dynamic loading in both tension and torsion are described. These machines are of the "falling weight" type, the yield stress being measured electronically and the total extension during a particular loading cycle is limited to a particular value. A series of tests in dynamic tension and dynamic torsion using ¾ in. cylindrical specimens was carried out on a medium-carbon steel, a mild steel, a silico-manganese spring steel, and two Al alloys. In straining specimens to fracture, the yield point was found to vary in a manner similar to that for static loading. All dynamic yield points showed a progressive increase in value with reduction in loading time. A greater percentage increase in yield point value was noted for the medium-carbon steel and the mild steel under dynamic torsion as compared with dynamic tension. The results are presented graphically in most cases.

16610 Trapping of Helium Ions and the Re-Emission of Trapped Atoms From Molybdenum. L. J. Varnerin and J. H. Garmichael. *Journal of Applied Physics*, v. 28, Aug. 1957, p. 913-919.

Measurements of the trapping efficiency η (atoms removed/ions collected) have been made over a range of ion energies from 150 to 2600 e.v. The re-emission of trapped He atoms was investigated in detail. The contribution of re-emission to the pumping process is described by a phenomenological theory.

16611* (Japanese.) **Static Strength of Welded Joints. III.** Shozaburo Ota. *Journal of Railway Engineering Research (Japan)*, v. 14, no. 5, May 15, 1957, p. 203-229.

Report is presented with a view to providing some guides to rational designs of welding through clarification of stress distribution, breaking strength, and breaking mechanism of welded joints under static load.

16612* (Russian.) Effect of Phosphorus Content on Wear-Characteristics and Friction of Gray Cast Iron. **Vliianie soderzhaniia fosfora na kharakteristiki iznosa i treniia serogo chuguna.** A. A. Ol'shevskii and M. M. Kantor. *Liteinoe Proizvodstvo*, no. 7, July 1957, p. 14.

Investigation resulted in finding optimum P-content for various cast iron applications, especially in railroad brake shoes. Compositions and characteristics are given.

16613 White Iron With Molybdenum Has Improved Wear Resistance. *Materials in Design Engineering*, v. 46, Aug. 1957, p. 144-145.

A new iron alloy containing Ni, Cr and Mo is said to have better wear resistance properties than similar alloys not containing Mo.

16614* (Dutch.) Copper and Copper Alloys. **Koper en Koperlegeringen. XVI.** Malleable Aluminum Copper Alloys. **Aluminiumkoper kneedlegeringen.** W. G. R. DeJager. *Metalen*, v. 12, Aug. 15, 1957, p. 290-292.

Properties of Al-Cu alloys containing approximately 10% Al, 3% Fe, and 4.75% Ni at different temperatures.

16615* (German.) Some Electrical Characteristics of Sprayed Metal Coatings. **Über einige elektrische Eigenschaften von Spritzmetallüberzügen.** K. Sagel. *Metalloberfläche*, v. 11, Aug. 1957, p. 255-257.

Specific resistance of sprayed Al, Cu, Zn, and Cu-Cr alloy coatings on glass, cardboard, and metallic base materials. Influence of layer thickness, spraying distance, thermal treatment, intermediate layers, and base material on conductivity.

16616* (Russian.) Process of Relaxation Under Repeated Loadings. **Protsess relaksatsii v usloviiakh povtornykh nagruzhenii.** T. I. Volkova. *Metallovedenie i Obrabotka Metallov*, 1957, no. 7, July, p. 13-18.

Experimental data concerning effects of structure, duration of experiment and intermediate heating on process of relaxation. Tables show compositions and properties of investigated materials and curves of relaxation.

16617* (Russian.) Carbon Content in Case-Hardened Steel. **O soderzhanii ugleroda v tsementuemykh staliakh.** S. S. Ermakov. *Metallovedenie i Obrabotka Metallov*, 1957, no. 7, July, p. 43-45.

The optimum carbon content for steels, working in conditions of repeated loadings, is 0.20-0.23%.

16618 The Physical Properties of Electrodeposited Metals. T. E. Such. *Metallurgia*, v. 56, Aug. 1957, p. 61-66.

Tensile strength, ductility, hardness, and internal stresses in electrodeposited metals. Description of the way in which these metals, and articles plated with them, are affected by changes in these properties, and methods for their determination. (To be continued.)

16619 Strain-Ageing as an Explanation of the "Knee" in the Fatigue Curve of Mild Steel. John C. Levy. *Metallurgia*, v. 56, Aug. 1957, p. 71-73.

An explanation is offered for the sharp "knee" and well-defined fatigue limit in the S-N curve of mild steel by postulating two such curves, one for the non-strain-aged material and another for the fully strain-aged material. Transformation from one to the other by strain-aging during the test can then produce the "knee" in the curve. This concept is shown to be consistent with reported experimental results.

16620 Mechanical Properties of C 355 Aluminum Casting Alloy. T. H. Owen and L. E. Marsh. *Metal Progress*, v. 72, Aug. 1957, p. 78-83.

Casting alloy 355 (nominally 5% Si, 1.3% Cu, and 0.5% Mg) has excellent foundry characteristics and is capable of heat treatment to high ultimate and yield strengths, but is lacking in ductility when its maximum strength is developed. An evaluation was made for alloy 355 and C-355. A table of data of alloy composition is given. A comparison of the properties of standard and high-purity 355 alloys in the T-62 condition indicates that the elongation is improved up to 100% with the high-purity material, and that ultimate and yield strengths are improved slightly. If the gas content of the metal is lowered to the same point by either vacuum or nitrogen degassing, the mechanical properties obtained will be the same. Mechanical properties of 355-type alloys are improved by quenching in 140 F water rather than in boiling water. The effect of residual stress has to be evaluated fully before such a quench is used.

16621* Some Properties of Nickel-Base Casting Alloys for High-Temperature Service. D. R. Wood and J. F. Gregg. *Metal Treatment and Drop Forging*, v. 24, Aug. 1957, p. 317-324.

Detailed information on six Ni-base alloys which are available for use under conditions involving stresses over a wide range of temperatures, and which can be used in the cast condition. Consideration is given to their casting characteristics and to factors affecting the production of good quality castings. Appropriate fields of application are also indicated.

16622* (French.) Theoretical Data on the Properties of Uranium. **Quelques données théoriques sur les propriétés de l'uranium.** A. Guinier. *Métaux, Corrosion-Industries*, v. 32, June 1957, p. 225-234.

The U atom, U crystal structure, thermal dilatation, plastic deformation of α-U, effects of fission, and reaction with other elements.

16623* (German.) Ultrasonic Absorption in Metals at Low Temperatures in the Normal- and Super-Conductive State. **Ultraschalldämpfung in Metallen bei tiefen Temperaturen im normal- und supraleitenden Zustand.** G. Kurtze. *Naturwissenschaften*, v. 44, no. 13, 1957, p. 368-370.

Method of measurement; speed; absorption. Simple theoretical considerations on the evaluation of electron absorption.

16624* (German.) Susceptibility Measurements on Alloys of Ni-Cr or Co-Ni-Cr and Other Components. **Suszeptibilitatsmessungen an Legierungen aus Ni, Cr Bzw. Co, Ni, Cr und weiteren Bestandteilen.** Wilhelm Wink and Werner Jellinghaus. *Naturwissenschaften*, v. 44, no. 13, 1957, p. 371.

16625 A Calorimetric Investigation of Zirconium, Titanium, and Zirconium Alloys From 60 to 960°C. J. L. Scott. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2328, Aug. 1957, 122 p. (UF767 U3o Contin.)

Determination of thermodynamic properties and heats of transformation.

16626 (English.) **Influence of Vacancies on the Thermal Expansion of Lead Near the Melting Point.** J. Van Duijn and J. Van Galen. *Physica*, v. 23, July 1957, p. 622-624.

The thermal expansion is measured for Pb from room temperature to 300 C by two methods: dilatometric and with X-rays. No difference is found. This result is either due to the concentration of vacancies being too small at high temperature or to the influence of vacancies on the lattice parameter.

16627 (English.) **Resistance and Magneto-Resistance of Dilute Alloys of Copper and Gold With Nickel at Low Temperatures.** G. J. Los and A. N. Gerritsen. *Physica*, v. 23, July 1957, p. 633-640.

The resistance temperature relation shows no irregularity down to 1.2 K. Deviations from the Kohler diagram and a decrease of the resistance in a magnetic field for the higher Ni concentrations in Cu (2.2 at.%) indicate the existence of anomalies of the same character as found for the alloys with Cr and Mn.

16628 Temperature Dependence of the Hall Coefficients in Some Silver Palladium Alloys. F. E. Allison and E. M. Pugh. *Physical Review*, v. 107, ser. 2, July 1, 1957, p. 103-105.

16629 The Atomic Heats of Lithium, Sodium, and Potassium Between 1.5° and 20°K. L. M. Roberts. *Physical Society, Proceedings*, v. 70, no. 452B, Aug. 1957, p. 744-752.

Smoothed values of the atomic heats are tabulated at intervals up to 20 K, and calculated values of θ are given graphically. The internal energy, entropy, and free energy are also tabulated.

16630 Absorption and Dispersion of Indium Antimonide. T. S. Moss, S. D. Smith, and T. D. F. Hawkins. *Physical Society, Proceedings*, v. 70, no. 452B, Aug. 1957, p. 776-784.

Transmission measurements have been used to determine absorption coefficients over the wavelength range 1.5-7.5μ, and interferometric determinations made of the refractive index from 7-20μ. A more accurate calculation is made of the radiation lifetime. Using these data, $\tau_R = 0.79\mu$ sec.

16631 The Low Temperature Electrical Conductivity of *n*-Type Germanium. S. H. Koenig and G. R. Gunther-Mohr. *Physics and Chemistry of Solids*, v. 2, no. 4, 1957, p. 268-283.

The dominant conductivity mechanism for the samples measured is associated either with the conduction band or with an impurity conduction mechanism according as the temperature is greater or less than 4 K.

16632 (German.) Effect of Surface Treatment of the Mechanical Characteristics of Tungsten. **Einfluss der Oberflächenbehandlung auf die mechanischen Eigenschaften von Wolfram.** K. Sedlatschek and D. A. Thomas. *Planseeberichte für Pulvermetallurgie (Suppl.)*, v. 5, Apr. 1957, p. 27-32.

Measurements of bending strength, tensile strength, deflection, and expansion show that mechanical characteristics can be improved by the removal through electropolishing of the surface layers produced in manufacture. The greatest effect is on tensile strength and expansion; greater removal leads to better characteristics.

16633* (Polish.) Effect of Heat Treatment on the Magnetic Properties of Generator Sheets of About 2.5% Silicon. **Wpływ obróbki cieplnej na własności magnetyczne blach prądnicowych o zawartości około 2,5% Si.** M. Markuszewicz and J. Groyecki. *Prace Instytutów Ministerstwa Hutnictwa*, v. 9, no. 3, 1957, p. 125-135.

A study of manufacturing problems such as phenomena of diffusion which take place during heat treatment and which depend on temperature, character of the medium, and duration of the process, and problems of low reduction and cold rolling. Lowest losses are obtained after annealing between 800 and 960 C.

16634* (Russian.) The Increase in Durability and Workability of Cast Magnets. **Povyshenie trochnosti i obrabatyvaemosti litykh magnitov.** I. B. Kupershinskii and F. N. Stepanov. *Priborostroenie*, no. 6, June 1957, p. 19-21.

Study of Fe-Ni-Al magnets. Additions of S and Ti improve the mechanical strength and "polishability" properties.

16635* (French.) Influence of Small Quantities of Aluminum on Some Mechanical Characteristics of Ferrite Containing Nitrogen. **Influence de petites quantités d'aluminium sur certaines caractéristiques mécaniques de la ferrite contenant de l'azote.** P. Flament. *Revue de Métallurgie*, v. 54, July 1957, p. 537-554.

16636 The Antiferromagnetism of Manganese Copper Alloys. G. E. Bacon, I. W. Dunmur, J. H. Smith, and R. Street. *Royal Society, Proceedings*, v. 241, ser. A, Aug. 7, 1957, p. 223-238.

Results of investigations are discussed in terms of an electron band model of an antiferromagnetic metal.

16637 The Effect of Pressure on the Electrical Resistance of Copper at Low Temperatures. J. S. Dugdale and D. Gugan. *Royal Society, Proceedings*, v. 241, ser. A, Aug. 20, 1957, p. 397-407.

The resistivity of Cu under hydrostatic pressures up to 3000 atm. was measured at temperatures between 4 K and room temperature. Two specimens of commercially pure Cu (99.98%) and an alloy of 0.056 at.% Fe in Cu were studied, the alloy being chosen because it showed a large resistance minimum. Both the residual resistivity of the alloy and its pressure coefficient appeared to be strongly dependent on temperature.

16638* (German.) The Tendency to Embrittlement of Steels as Dependent on Stress Condition and Temperature. **Die Sprödbruchneigung von Stählen in Abhängigkeit von Spannungszustand und Temperatur.** Albert Kochendörfer and Herbert Scholl. *Stahl und Eisen*, v. 77, July 25, 1957, p. 1006-1018.

Shapes of test bars examined and their multi-axiality figures. Yielding and rupturing stress as dependent on the multiaxiality figure and temperature. Representation of this dependency in three-dimensional diagrams. Brittle fracture temperature and transition temperature as dependent on the stress condition. Arrangement of the results of notched bar impact tests. Conclusions to be drawn for testing tough or brittle fracture behavior.

16639* (Russian.) The Influence of Impurities on Properties of the Nickel-Chromium Super-Alloys. **Vliianie primesei na svoistva zharoprochnykh splavov na nikel'khromovoi osnove.** M. V. Pridantsev and G. V. Estulin. *Stal'*, v. 17, July 1957, p. 636-640.

Lead, Sb, and other easily fusible elements, which reduce intercrystalline stability of metal, are the specifically harmful impurities and therefore should be removed as completely as possible.

16640 (Czech.) Fractures of Crank-Shafts in Large Piston Compressors Caused by Fatigue. **Únavové lomy klikových hřídelů velkých pistových kompresorů.** Jos. Sadílek and A. Kornel. *Strojírenství*, v. 7, July 1957, p. 497-501.

16641* (Norwegian.) Testing Material for Brittle Fracture. **Materialprovning i forbindelse med sprøbrudd.** Bjorn Augland. *Tekinsk Ukeblad*, v. 104, Aug. 8, 1957, p. 601-608.

Specifications for brittle fracture tests. Origin and propagation. Determining tendencies to brittle fracture in steel. Process diagrams and criteria. Drop weight test. Eccentric tensile tests.

16642 The Effect of Sulphur on the Properties of Titanium and Titanium Alloys. L. W. Berger, D. N. Williams, and R. I. Jaffee. Paper from "Transactions of American Society for Metals". v. XLIX. 1957. p. 300-314. (TS300 Am35t Vis.)

Additions of up to 0.025 weight % S to Ti resulted in increased tensile strength and decreased ductility. Further additions of S up to 0.45 weight %, had little effect on tensile properties. Very small additions of S effectively refined the grain size of Ti and Ti alloys, both in the as-cast and as-wrought conditions.

16643 Strength and Ductility of Bainitic Steels. Donald H. Desy, J. O. Brittain, and M. Gensamer. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3989, Aug. 1957, 32 p. (TL570 Un3t)

Preliminary measurement of X-ray line broadening indicate that the degree of internal strain may be the controlling factor in determining the strength of bainite. The transition temperatures of the baintes fell within a band between −80 and −160 C and did not vary regularly with hardness, carbon or alloy content, or mean ferrite path.

16644* (German.) Magnetic Properties of Thin Electrolytically Deposited and Vapor-Deposited Nickel and Iron Coatings. **Magnetische Eigenschaften dünner elektrolytisch niedergeschlagener und aufgedampfter Nickel- und Eisenschichten.** Ludwig Reimer. *Zeitschrift für Naturforschung*, v. 12a, July 1957, p. 550-557.

Saturation magnetization, residual magnetism, permeability, and reversible magnetization.

16645* (Russian.) Investigation of the Thermodynamic Properties of Binary Metallic Systems by the Electromotive Force Method. **Issledovanie termodinamicheskikh svoistv dvoinykh metallicheskikh sistem metodom E.D.S. II.** The Systems Cadmium-Copper. **Sistema kadmii-med'.** A. V. Nikol'skaia, P. P. Otopkov, and Ia. I. Gepasimov. *Zhurnal Fizicheskoi Khimii*, v. 31, May 1957, p. 1007-1012.

Study of the e.m.f. of the concentration cells $Cd|CdCl_2|(Cd_xCu_{1-x})$ for Cu-Cd melts over the range 0.948-0.460 mole fractions of Cd at 25-degree temperature intervals from 575-650 C.

See also: **16033** (friction effects of sulfurizing); **16419** (properties of metals); **16562** (properties of pressure-casting alloys); **16679** (fatigue tests on Al alloys); **16694** (age hardening of Ti or Zr brasses); **16712** (effect of microstructure on strength); **16718** (magnetic properties of Mn_2Sb); **16720** (electric conductivity of high purity Fe and Al); **16726** (effects of lattice defects on properties).

METALS—MECHANICAL WORKING

16646 Electrical Discharge Cuts "Impossible" Slits. Edward J. Lach and Carl Munter. *American Machinist*, v. 101, Aug. 12, 1957, p. 105-107.

Seven slits, 2 in. high and as narrow as 0.015 in. wide, were machined out of heavy U and monel rings. Only one slit was straight through, the other six were tapered wider inside the work.

16647 Machining MST 6A1-4V Titanium. I-III. N. Zlatin, J. F. Kahles, G. L. Marsh, and G. W. Bauer. *American Machinist*, v. 101, Aug. 26, 1957, p. 135 + 2 pages.

16648* (Polish.) Influence of the Coefficient of Friction on the Magnitude of the Spread During Rolling Wedge-Like Specimens. **Wpływ współczynnika tarcia na wielkość poszerzenia w czasie ściskania próbek klinowych.** Wacław Leskiewicz and Stefan Kwiatkowski. *Archiwum Hutnictwa*, v. 2, no. 2, 1957, p. 167-182.

16649 Mechanism of Action of Lubricants in the Working of Metals. S. Ia. Veiler, V. I. Likhman, and P. A. Rebinder. *Henry Brutcher Translation No.* 3943, 8 p. (From *Doklady Akademii Nauk SSSR*, v. 110, no. 6, 1956, p. 985-988.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 5903, v. 6, Apr. 1957.

16650 Add Copper to Make Steel Bars More Machinable. *Iron Age*, v. 180, Aug. 22, 1957, p. 112-114.

Controlled amounts of copper in cold drawn steel bars boost machinability and improve wear and corrosion resistance.

16651 Making Better Steel Sheet: Metal Behavior During Cold Rolling and Aging. H. C. Rogers. *Journal of Metals*, v. 9, Aug. 1957, p. 1034-1039.

The correlation of modern theories of dislocation, and strain-aging with the effects of mechanical working give new insight into the design and practical use of cold rolling facilities.

16652 Functional Testing of Cold Reduction Lubricants. J. F. Griffin. *Journal of Metals*, v. 9, Aug. 1957, p. 1042-1043.

The use of the torque test to evaluate the frictional properties of rolling oils under extreme pressures at speeds approaching zero.

16653* (English.) **On the Cutting Mechanism for Soft Metals.** Keiji Okushima and Katsundo Hitomi. *Kyoto University, Memoirs of the Faculty of Engineering*, v. 19, Apr. 1957, p. 135-166.

By orthogonal dry cutting of soft metals such as lead and Lipowitz alloy in low velocity with a specially designed cutting test equipment, the existence of the transitional region between the rigid region of the workpiece and the plastic region of the steady chip was recognized. This should be taken into consideration in the theoretical analysis of cutting mechanism instead of the single shear plane.

16654 Broaching Titanium. L. B. Gray. *Machinery*, v. 63, Aug. 1957, p. 135-141.

Excellent results were obtained in broaching Ti alloy compressor discs, blades, and other jet-engine parts.

16655 Splines Formed Ten Times Faster by Cold-Rolling. Miles Etzel and C. E. Kopp. *Machinery*, v. 63, Aug. 1957, p. 165-167.

Production was increased and manufacturing costs lowered by cold-forming splines in the hardened and ground shafts of AISI 410 stainless steel.

16656 Cold Extrusion of Steel. Ben Kaul. *Machinery*, v. 63, Aug. 1957, p. 176-184.

A simplified detailed explanation of the process.

16657 The Machinability Concept. K. G. Lewis. *Metal Treatment and Drop Forging*, v. 24, Aug. 1957, p. 331-334.

The relevance to machining performance of the factors: chip formation, intermittent cutting, and hardness. (To be continued.)

16658* Experimental Study of the Mechanism of Plastic Deformation in Metal Cutting Compared With the Methods of Classical Stressing. Paul Bastien and Michel Weisz. *Microtecnic (English Ed.)*, v. 11, no. 3, 1957, p. 122-129.

Equations are given and comparisons made by graphical representation. (To be continued.)

16659* How to Deep Draw Titanium Alloys. E. A. Farrell. *Modern Metals*, v. 13, Aug. 1957, p. 60 + 3 pages.

Drawing factors for three high-strength alloys were determined. Variables investigated included draw speed; temperature of material and dies; diameter of blanks; gauge of material; draw radius; and punch radius.

16660 When to Use Cold Extrusion for Steel Parts. Charles B. Grace. *Product Engineering*, v. 28, Aug. 1957, p. 145-147.

When to use in designing shafts, cylinders, and other parts of similar shape.

16661 Chem-Mill Reduces Fabrication Problems. L. G. Hall. *SAE Journal*, v. 65, Aug. 1957, p. 30-31.

A chemical metal-etching process. Aluminum, Ti, Mg, and many alloy steels may be etched without materially altering physical and mechanical properties. Not recommended for use on castings and metal surface irregularities, such as dents and scratches are amplified by the process.

16662 (German.) Metallurgical Processes in Steel Grinding. **Metallurgische Vorgänge beim Schleifen von Stahl.** H. Staudinger. *Schweizer Archiv für Angewandte Wissenschaft und Technik*, v. 23, July 1957, p. 231-240.

Effects of previous thermal treatment and of the grinding process itself. Changes in surface structure due to grinding. Decrease in fatigue strength from unfavorable grinding conditions.

16663 Production of Sheet-Metal Components in Relation to Surface Quality and Finishing Processes. D. H. Lloyd. *Sheet Metal Industries*, v. 34, Aug. 1957, p. 577-584.

Effects of forming operations on internal structure and surface characteristics.

16664 Tooling for Precision Presswork. J. C. Galway. *Sheet Metal Industries*, v. 34, Aug. 1957, p. 593 + 8 pages.

Development, design, and application of the dieing press.

16665* (German.) Calculation of the Average Resistance to Deformation in the Hot-Rolling of Steel. **Die Berechnung des mittleren Verformungswiderstandes beim Warmwalzen von Stahl.** Alexander Geleji. *Stahl und Eisen*, v. 77, July 11, 1957, p. 931-933.

16666 Cold Treatment Ups Workability. *Steel*, v. 141, Aug. 5, 1957, p. 93-94.

Subzero cooling (−40 F) speeds cuts in tough metals like AISI 4130. Tools last up to five times longer.

16667 Planisher Shaves Weld Costs. *Steel*, v. 141, Aug. 19, 1957, p. 150-151.

It rolls welds flat, improving physical properties and quality. Virtually eliminates filler metal in sheets up to 0.093 in. thick.

16668 Spinning Keeps Pace With New Technology. *Steel*, v. 141, Sept. 2, 1957, p. 131-134.

New developments and automatic methods have increased the advantages of this technique.

16669 The Fundamentals and Application of Form and Thread Rolling. I. Clifford T. Appleton. *Steel Processing and Conversion*, v. 33, Aug. 1957, p. 440-446.

(To be continued.)

16670* Pull Reaming Prevents Runout Problems. William G. McEwan. *Tool Engineer*, v. 39, Sept. 1957, p. 91-94.

Advantages of this method.

16671* How to Use Ceramics on Today's Machine Tools. M. C. Shaw, A. D. Hoch, and T. R. Reinhart. *Tool Engineer*, v. 39, Sept. 1957, p. 109-114.

An evaluation of the present developments in ceramic tooling.

16672* (Russian.) Stresses in Pipes During Cold Rolling. **Usiliia pri kholodnoi prokatke trub.** I. M. Pavlov and D. I. Piriazev. *Tsvetnye Metally*, v. 30, no. 7, July 1957, p. 63-70.

Distribution of total pressure of the metal on the rollers. Effects of feed, total stretching, rolling speed, wall thickness, and lubrication on pressure.

16673* (Russian.) The Origin of Glassy Surface on Discs. **O proiskhozhdenii steklovidnoi poverkhnosti na instrumente pri vysadke.** I. V. Trush. *Vestnik Mashinostroeniia*, v. 37, July 1957, p. 55-56.

A sulfuration of the die takes place when billets are removed from it. This glassy layer having antifriction properties and a low heat conductivity, has a positive effect on die durability. Attempts are being made to obtain this protective layer artificially.

16674 Wire Mill Finishes. R. T. Merrell. *Wire and Wire Products*, v. 32, Aug. 1957, p. 883 + 3 pages.

Characteristics of some of the finishes now available.

See also: **16085** (automatic machining); **16086** (automatic machining operations); **16098** (hot-roll mill auxiliary drive); **16568** (dual rolling of Al foils); **16584** (tool steels for cold stamping); **16749** (gaging of steel strips); **16752** (quality control in machining).

METALS—METALLOGRAPHY, TRANSFORMATIONS, AND STRUCTURES

16675 (English.) **Stacking Faults by Low-Temperature Cold Work in Copper and Alpha Brass.** C. N. J. Wagner. *Acta Metallurgica*, v. 5, Aug. 1957, p. 427-434.

Deformation stacking faults on the (111) planes produce peak shifts, and twin faults produce peak asymmetries. Both kinds of faults contribute to the particle size broadening. The probability of faulting increases with increasing Zn content and is appreciably greater if filed at liquid-nitrogen temperature than if filed at room temperature.

16676 (English.) **Growth of Voids in Metals During Diffusion and Creep.** R. W. Balluffi and L. L. Seigle. *Acta Metallurgica*, v. 5, Aug. 1957, p. 449-454.

The effect of stress in the absence of large stress concentrations is probably to increase the equilibrium vacancy concentrations at sinks within the grains, thereby diverting extra vacancies into voids. Void formation at grain boundaries, where the vacancies are maintained near equilibrium, is explained as a result of stress.

16677 (English.) **Segregation at the Eutectic Temperature.** B. C. Allen and S. Isserow. *Acta Metallurgica*, v. 5, Aug. 1957, p. 465-472.

The segregation effect can be amplified by repeated cycles involving alternate heating and cooling through the eutectic temperature. The effect was investigated most thoroughly in the U-Al system, where the density differences are unusually favorable for its manifestation.

16678* (German.) The Statistical Pattern of Metallic Tungsten. **Über das statistische modell des metallischen wolframs.** L. Szász. *Acta Physica Academiae Scientiarum Hungaricae*, v. 7, no. 2, 1957, p. 225-249.

Calculation of lattice energies, lattice constants, and compressibility of the metal, and of the specific heat of the electrons.

16679* (Italian.) On Structural Transformations of Aluminum Alloys During Fatigue Tests. **Sui cambiamenti strutturali nelle leghe di alluminio durante le prove di fatica.** F. Gatto. *Alluminio*, v. 26, July-Aug. 1957, p. 315-317.

Tests on notched samples under rotary bending loads confirm that fatigue behavior of Al-Cu-Mg alloys is determined by the precipitation of Cu. A new possible mechanism of the "size effect" in fatigue tests is also indicated.

16680* (German.) Determination of the Mosaic-Like Structure of Crystals of Annealed Martensite by Means of an Electron Microscope. **Bestimmung der mosaikartigen Struktur der Kristalle des angelassenen Martensits mittels eines Elektronmikroskops.** Alois Masín. *Annalen der Physik*, v. 19, nos. 6-8, 1957, p. 257-261.

Structure was ascertained and described, and changes during annealing studied. Form, size, and arrangement of the mosaic blocks are very stable, showing no change in the 550-700 C range.

16681* (German.) Influence of Electrolytic Transfer of Carbon on the Aging of α-Iron. **Einfluss elektrolytischer Überführung von Kohlenstoff auf die Alterung von α-Eisen.** Friedrich Erdmann-Jesnitzer and Klaus Ouvrier. *Archiv für das Eisenhüttenwesen*, v. 28, July 1957, p. 423-431.

Transfer of C into α-iron at 825 C. Speeding up hardness and resistance changes in Armco iron wires as a result of current flow during aging at 80 C after quenching.

16682 Grain Growth of Technical Titanium on Heating. L. N. Sokolov. *Henry Brutcher Translation No.* 3856, 5 p. (From *Metallovedenie i Obrabotka Metallov*, v. 2, no. 10, 1956, p. 34-36.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 2943, v. 34, Feb. 1957.

16683 Anisotropy of the Rate of Crystal Growth. F. P. Rybalko. *Henry Brutcher Translation No.* 3942, 4 p. (From *Fizika Metallov i Metallovedenie*, v. 3, no. 1, 1956, p. 184-185.) Henry Brutcher, Altadena, Calif.

Findings contradict the "rule" that the ratio among the rates of growth of individual crystal faces remains constant regardless of changes in the conditions of crystallization.

16684 The Problem of Graphitization of Low-Carbon Steel. I. V. Salli and I. I. Pyasetskii. *Henry Brutcher Translation No.* 3952, 6 p. (From *Fizika Metallov i Metallovedenie*, v. 3, no. 3, 1956, p. 513-515.) Henry Brutcher, Altadena, Calif.

The mechanism of graphitization, with special reference to processes occurring during heat treatment in vacuum. Effect of cooling rate upon precipitation of graphite.

16685 Sigma Phase in 25-20 Steel Welds. B. I. Medovar. *Henry Brutcher Translation No.* 3954, 6 p. (From *Metallovedenie i Obrabotka Metallov*, no. 3, Mar. 1957, p. 27-30.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 10549, v. 6, July 1957.

16686 Gases and Nonmetallic Inclusions in Continuous Cast Steel. V. I. Yavoiskii. *Henry Brutcher Translation No.* 3964, 26 p. (From *Proceedings of the First All-Union Conference on the Continuous Casting of Steel—October* 1955, Moscow, 1956, p. 199-211.) Henry Brutcher, Altadena, Calif.

Reviews literature on segregation, distribution, and amounts of nonmetallic inclusions and gases (H and N) in continuous cast steel, compared with still-cast conventional ingots.

16687 Kinetics of Change in Microstructure of Metals and Alloys During Creep (Involving High-Temperature Heating Under Tension and Vacuum). M. G. Lozinskii and E. I. Antipova. *Henry Brutcher Translation No.* 3965, 10 p. (From *Metallovedenie i Obrabotka Metallov*, v. 1, no. 5, 1955, p. 9-14.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 5226, v. 5, May 1956.

16688* (French.) Formation Mechanism of the Polygonization Under-Structures Observed on α-Uranium After Thermal Treatment in the γ-Phase. **Mécanisme de formation des sous-structures de polygonisation observées sur l'uranium α après traitements thermiques en phase γ.** André Robillard and Daniel Calais. *Comptes Rendus*, v. 245, July 17, 1957, p. 309-312.

The understructure of α-uranium after annealing in γ and tempering is a trace of the polygonization of the β-phase due to the $\gamma \rightarrow \beta$ transformation. This was confirmed by similar treatments of U-Cr alloys (1.4% Cr) with stabilized β-phase by tempering at room temperature.

16689* (French.) Spectroscopic Examination of Discontinuous Phase Change and Tempering in Chromium and Potassium Alum. **Observation spectroscopique d'un changement de phase discontinu et d'un phénomène de trempe dans l'alun de chrome et de potassium.** Lucienne Couture. *Comptes Rendus*, v. 245, July 29, 1957, p. 515-517.

The discontinuous phase change at 60 K as shown by optical absorption spectra. If the crystal is tempered by rapid cooling, no phase change occurs and the crystal remains indefinitely metastable.

16690* (Russian.) Volume Changes of Carbide Phase in the Tempering of Steel. **Ob'emnye izmeneniia karbidnoi fazy pri otpuske stalei.** N. N. Liulicheva. *Fizika Metallov i Metallovedenie*, v. 4, no. 2, 1957, p. 319-330.

The change in volume of the carbide phase in steels with heterogeneous structure was studied by methods of stereometallography. Carbon-, Si-, and Mn steels were analyzed under the optical and electron microscopes within a temperature range of 450 to 700 C.

16691* (French.) The Grain in Cast Iron. A General Study. **Le grain dans la fonte. Étude d'ensemble.** Michel Ferry and Jean-Claude Margerie. *Fonderie*, 1957, no. 138, July, p. 303-315.

Effect of recooling and charge composition on grain size. Relationship between grain size and mechanical properties. Considerable supporting data.

16692* (Czech.) Eutectoid Reaction. **Eutektoidní reakce. I.** Pearlite Reaction in Carbon Steels. **Perlitická reakce v uhlíkových ocelích.** Josef Čadek. *Hutnické Listy*, v. 12, July 1957, p. 585-592.

A critical discussion on the basis of data from the literature.

16693 Equilibrium Conditions in the Copper-Oxygen-Cadmium-Phosphorus System. A. D. Michael, R. W. Ruddle, and A. Cibula. *Institute of Metals, Journal*, v. 85, Aug. 1957, p. 506-517.

16694* (Spanish.) Age-Hardening Capacity of Some Brasses Containing Zirconium or Titanium. **Sobre la posibilidad de endurecer por envejecimiento algunos latones conteniendo circonio o titanio.** Sebastian Feliu Matas. *Instituto del Hierro y del Acero*, v. 10, Apr.-June 1957, p. 160-165.

Studies on four ternary brasses containing approximately 70:30 Cu:Zn plus 0.56% Zr or 0.57, 1.35, or 2.09% Ti.

16695 Boron Rids Steels of Stretcher Strains. P. M. Unterweiser. *Iron Age*, v. 180, Aug. 8, 1957, p. 79-81.

Boron is effective in eliminating N strain aging from commercial open-hearth steels.

16696 The Precipitation of ε-Carbide by Ageing of Soft Steel. N. Hansen and E. W. Langer. *Iron and Steel Institute, Journal*, v. 186, Aug. 1957, p. 422-424.

The aging process at 250 C was followed with the electron microscope. The first visible precipitate is observed after peak hardness values have been passed; the precipitated particles are needle-shaped and do not change in appearance on aging up to 18 hr.

16697 A Note on the Transformation of Austenitic Manganese Steel. A. E. W. Smith. *Iron and Steel Institute, Journal*, v. 186, Aug. 1957, p. 425-428.

A series of isothermal treatments of quenched austenitic (Hadfield) Mn steel has shown the main features of the transformation and enabled a tentative S-curve to be drawn.

16698* (Russian.) The Kinetics of Martensite Transformations. **O zakonomernostiakh kinetiki martensitnykh prevrashchenii.** G. V. Kurdiumov and O. P. Maksimova. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk*, 1957, no. 6, June, p. 4-11.

A study of isothermal martensitic transformations, from room temperature to −180 C in an iron alloy with 23% Ni and 3.4% Mn. Formation of martensitic nuclei in steel with 0.85% C and 2.2% Mn with a martensitic point near 155 C.

16699* (Russian.) Investigation of Chromium-Rich Chromium-Silicon Alloys. **Issledovanie splavov khroma s kremniem bogatykh khromom.** L. N. Guseva and B. I. Obechkin. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk*, 1957, no. 6, June, p. 27-31.

Chemical and phase composition of alloys of 99.8% pure Si and electrolytically refined Cr. Domain of the composition diagram, rich in Cr (35% Si); X-ray and microscopic analysis.

16700 X-Ray Study of Polygonization in Copper Single Crystals. C. T. Wei, M. N. Parthasarathi, and P. A. Beck. *Journal of Applied Physics*, v. 28, Aug. 1957, p. 874-877.

Polygonization in bent Cu crystals is much more sluggish than in similar Zn or Al specimens at corresponding temperatures. This may be rationalized as due to the low rate of climbing of extended dislocations.

16701 Theory of Diffusion Constants in Interstitial Solid Solutions of b.c.c. Metals. A. Ferro. *Journal of Applied Physics*, v. 28, Aug. 1957, p. 895-900.

Attempts to evaluate the activation energy of interstitial diffusion in body-centered cubic metals on the basis of the distortion energy necessary to open one of the flat interstitial cavities (½ 00) adjacent to an occupied one to a size equal to the diameter of the interstitial atom.

16702 An Investigation of the Zirconium-Tantalum System. V. S. Emelyanov, Yu. G. Godin, and A. I. Evstyukhin. *Journal of Nuclear Energy*, v. 5, no. 2, 1957, p. 247-252 + 3 plates. (Translated from *Atomnaia Energiia*, v. 2, 1957, p. 42-47.)

Metallography, X-ray diffraction, thermal analysis, electrical resistance, and hardness measurements were employed in the study of the Zr-Ta system and the determination of its phase diagram. The diagram is a eutectic type and shows limited solubility in the solid state. The maximum solubility of Ta in α-Zr at 790 C is less than 0.22 at.% while β-Zr will dissolve 16 at.% of Ta at 1585 C. Maximum solubility of Zr in Ta is 17 at.% at 1585 C. The eutectic occurs at 1585 C and 34 at.% Ta. A eutectoidal transformation of the solid solution based on β-Zr takes place at 790 C; the eutectoidal composition is 7 at.% Ta.

16703 The Recording of Electron Diffraction Patterns From Single Crystals Using the Metropolitan-Vickers Type E.M.3 Electron Microscope. R. E. Burge, H. R. Munden, and C. D. Curling. *Journal of Scientific Instruments*, v. 34, Aug. 1957, p. 305-306.

An adjustable rectangular diffraction aperture is used to reduce the diffraction area selected at the specimen to a minimum. Two pairs of deflector plates at right angles, to which saw-tooth waveform voltages are applied, are useful in the accurate measurement of the intensities in single crystal patterns.

16704* (Russian.) The Mechanism of the Structure Transformations in the Agehardening Alloys on the Nickel Base. **Mekhanizm strukturnykh prevrashchenii v stareiushchikh splavakh na osnove nikelia.** Iu. A. Agariatskii and Iu. D. Tiapkin. *Kristallografiia*, v. 2, no. 3, 1957, p. 419-423 + 4 plates.

Single crystals of binary, ternary and quaternary Ni base alloys with Al, Ti, and Cr were studied by X-ray oscillating and diffuse scattering methods. The sequence of changes in atomic structure that takes place in formerly homogeneous solid solutions after quenching and annealing at 700-850 C was found.

16705* (Russian.) Some Peculiarities in the Crystallization of Silicon Single Crystals. **Spiral'nyi rost kristallov kremniia.** N. A. Shamba and N. N. Sheftal'. *Kristallografiia*, v. 2, no. 3, 1957, p. 441-444 + plates.

The important role of spiral forms of growth during the crystallization of Si from the melt. Spiral structure of Si needle crystals.

16706* (Russian.) Effect of Oxidation on Cast Iron Graphitization. **Vliianie okisleniia na grafitizatsiiu chuguna.** K. P. Bunin, G. Z. Koval'chuk, and S. A. Fedorova. *Liteinoe Proizvodstvo*, 1957, no. 7, July, p. 15-16.

Investigation of graphitization mechanism in an oxidizing medium and its effect on diffusion of vacancies in the sample.

16707* (Russian.) Austenitic Cast Iron With Nodular Graphite. **Austenitnyi chugun s sharovidnym grafitom.** F. N. Tavadze, I. A. Bairamishvili, and D. V. Khantadze. *Liteinoe Proizvodstvo*, 1957, no. 7, July, p. 16-17.

Introduction of Mn as modifier in order to obtain a cast iron of high machinability. Initial composition of the cast iron.

16708* (German.) Copper-Lead Alloys. **Kupfer-Blei-Legierungen. II.** The Influence of Nickel on the Form of the Phase Diagram. **Der Einfluss von Nickel auf die Gestaltung des Zustandsdiagrammes.** E. Pelzel. *Metall*, v. 11, Aug. 1957, p. 667-670.

Nickel additions of about 2% with 60% Pb close the gaps in the range of miscibility of binary Cu-Pb alloys. In place of phase separation in the fluid state, two-phase Cu-Ni mixed crystals and Pb residues appear.

16709* (German.) The Structure of Alloy Electrodeposits. **Der Aufbau galvanischer Legierungsniederschläge. XII.** The Copper-Zinc Alloys. **Die Kupfer-Zinn-Legierungen.** E. Raub and F. Sautter. *Metalloberfläche*, v. 11, Aug. 1957, p. 249-252.

X-ray and micrographic study; reflection and hardness measurements; influence of thermal treatment on properties.

16710* (Russian.) Two Mechanisms of Microheterogenization of Crystals of Solid Solution in Two-Phase Alloys. **Dva mekhanizma mikrogeterogenizatsii kristallov tverdogo rastvora v dvukhfaznykh splavakh.** V. M. Glazov and G. A. Korol'kov. *Metallovedenie i Obrabotka Metallov*, 1957, no. 7, July, p. 18-23.

Experimental proof of existence of the two mechanisms which are located (according to their content) to the right of the saturation point at eutectic temperature.

16711* (Russian.) Structural Changes of Hard Alloys During Heating. **Izmenenie struktury tverdykh splavov pri nagrevanii.** P. K. Mikhailova. *Metallovedenie i Obrabotka Metallov*, 1957, no. 7, July, p. 45-48.

Decomposition of solid solution of carburizing phase gives possibility for increasing plasticity and toughness of hard alloys.

16712 Mechanical Properties Versus Microstructure. J. B. Malerich and G. V. Cash. *Metal Progress*, v. 72, Aug. 1957, p. 106-111.

Tempered martensite is the best microstructure for low-alloy Cr-Mo-V steel if impact strength and ductility (in tensile and stress-rupture tests) are desired; fine bainite is best if short-time tensile and stress-rupture strength is desired; coarse bainite has best creep strength at 900 and 1000 F.

16713* (German.) Studies on the Electrolytic Transferability of Carbon, Boron, and Nitrogen as well as of Chromium, Silicon and Phosphorus Into Armco Iron and Steel. **Untersuchungen zur elektrolytischen Überführbarkeit von Kohlenstoff, Bor, Stickstoff sowie Chrom, Silizium und Phosphor in Armcoeisen und Stahl.** Friedrich Erdmann-Jesnitzer. *Neue Hütte*, v. 2, June 1957, p. 349-361.

Principles of electrolytic transfer in the solid state and bibliography. Preparation of test pieces. Spectroscopic analysis; differences caused by various types of mixed crystals.

16714* (German.) Carbides in Ferrous Alloys With a High Chromium and Carbon Content. **Karbide in Eisenlegierungen mit hohem Chrom- und Kohlenstoffgehalt.** H. Tůma, K. Löbl, and J. Ježek. *Neue Hütte*, v. 2, June 1957, p. 362-366.

Measuring installation and method of operation. Carbides in FeCrC alloys. Changes in the composition and structure of carbides during extended elevated temperature treatment.

16715 Metallographic Quality Studies of Thorium Metal. S. J. Broderick and A. J. Busch. *New Brunswick Laboratory (U. S. Atomic Energy Commission)*, NBL 135, Apr. 1957, 39 p. (UF767 Un3.1nb Contin.)

Tentative rating methods for metal quality are proposed, based on the number and diameter of the inclusion clusters in cast metal. For the wrought material, the quality ratings follow the method as proposed for uranium, namely, the total length of the stringers found over a definite area. Thirty-one photomicrographs of varied inclusion shapes and concentrations are shown.

16716 The Diffusion of Oxygen in Zirconium and Its Relation to Oxidation and Corrosion. J. Paul Pemsler. *Nuclear Metals, Inc. (U. S. Atomic Energy Commission)*, NMI-1177, May 1957, 49 p. (UF767 Un3.1nm Contin.)

Diffusion was studied in the temperature range of 400 to 585 C by observing the rates of dissolution of anodically deposited interference oxide films.

16717 Diffusion of Antimony Out of Germanium and Some Properties of the Antimony-Germanium System. R. C. Miller and F. M. Smits. *Physical Review*, v. 107, ser. 2, July 1, 1957, p. 65-70.

16718 The Magnetic Structure of Mn_2Sb. M. K. Wilkinson, N. S. Gingrich, and C. G. Shull. *Physics and Chemistry of Solids*, v. 2, no. 4, 1957, p. 289-300.

Values of $+2.13 \pm 0.20\mu_B$ and $-3.87 \pm 0.40\mu_B$ were obtained for the magnetic moments of the Mn atoms on the two sublattices from single crystal investigations, and these experimental values satisfactorily explain the scattering from powdered samples at temperatures from 78 to about 800 K.

16719 Hydrogen-Uranium Phase Diagrams. M. W. Mallett and M. J. Trzeciak. Paper from "Problems in Nuclear Engineering", v. I. p. 168-169. 1957. Pergamon Press. (TK9006 En34s Over.)

Phase diagrams were constructed for the H-U system. Recent solubility data were used to prepare diagrams based on terminal solubilities and solubilities at one atmosphere H pressure.

16720 (French.) Electrical Conductivity of High Purity Metals at Very Low Temperatures and Application to Recrystallization Phenomena. **Conductibilité électrique aux très basses températures des métaux de très haute pureté et application aux phénomènes de recristallisation.** Michel Caron. *Publications Scientifiques et Techniques du Ministère de l'Air*, 1957, no. 328, 58 p. (TL502 F84.1p Vis.)

Chemical analysis of the Al and Fe samples studied. Description of the apparatus used. Effect of recrystallization of pure Al on electrical conductivity. Electrical resistance of pure Al at very low temperatures. Low temperature conductivity of high purity Fe.

16721* (French.) Micrographic Study of an Alpha Brass Subject to Plane Alternated Bending. **Etude micrographique d'un laiton alpha soumis à la flexion plane alternée.** Pierre A. Jacquet. *Revue de Métallurgie*, v. 54, July 1957, p. 489-519.

16722* (French.) Fluorine Diffusion in Solid Silver. **Diffusion du fluor dans l'argent solide.** J. L. Meijering. *Revue de Métallurgie*, v. 54, July 1957, p. 520-522.

By heating Ag containing 0.05% Mg in AgF, two diffusion zones are obtained. The two sharp boundaries are not affected preceptibly by grain boundaries. This "internal fluorination" causes hardening. The inner zone probably contains MgF_2 and the outer zone a double fluoride such as $AgMgF_3$.

16723 The Determination of the Elastic Field of an Ellipsoidal Inclusion, and Related Problems. J. D. Eshelby. *Royal Society, Proceedings*, v. 241, ser. A, Aug. 20, 1957, p. 376-396.

The elastic field may be found very simply with the help of a sequence of imaginary cutting, straining, and welding operations. If the region is an ellipsoid the strain inside it is uniform and may be expressed in terms of tabulated elliptic integrals.

16724* (Russian.) Intermediate Stages in the Formation of Carbides of Titanium, Zirconium, Vanadium, Niobium, and Tantalum. **Promezhutochnye stadii reaktsii obrazovaniia karbidov titana, tsirkoniia, vanadiia, niobiia, i tantala.** G. V. Samsonov. *Ukrainskii Khimicheskii Zhurnal*, v. 23, no. 3, 1957, p. 287-296.

Tensiometric tests of the formation of these carbides were conducted under vacuum. Intermediate oxides of ZrO_2 and ZrO similar to Ti_2O_3 and TiO have a cubic face-centered lattice (a=4.62 A).

16725 Calculation of the ThS-U and ThS-Ti Phase Diagrams. Leo Brewer. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-3805, June 1957, 4 p. (UF767 U3u Contin.)

16726* (Russian.) Defects in the Crystal Structure and Certain Properties of Metals and Alloys. **Defekty kristallicheskogo stroeniia i nekotorye svoistva metallov i splavov.** I. Ia. Dekhtiar. *Uspekhi Fizicheskikh Nauk*, v. 62, no. 2, June 1957, p. 99-128.

The types of atomic deformation in crystal structure and their nature. Determining the density of defects. The effect of defects in crystal structure on diffusion, electric resistance, plastic deformation, and other properties of metals and alloys.

16727* (German.) Development of Spheroidal Graphite in Cast Iron. **Zur Frage der Bildung von kugelförmigem Graphit im Gusseisen.** Kurt Grütter. *von Roll Mitteilungen*, v. 14, nos. 1-4, 1955, 62 p.

Since the formation of spheroidal graphite in cast iron is attributed to essential changes of physical properties of molten cast iron, the surface tension and speed of diffusion of carbon in various pig- and cast irons were measured. Using an adaptation of the capillary depression method, a surface tension, value of 800-1100 dynes per cm. was determined. Cast iron containing spheroidal graphite showed a 40 to 50% higher value, about 1300 to 1400 dynes per cm. Surface tension was shown to be an inverse function of the quantity of S. With rising temperature the surface tension remains almost constant, decreasing slowly above 1400 C. The form of graphite corresponds, to a certain degree, with surface tension. Thus, at 1300- to 1400 dynes per cm. spheroidal graphite is present. Between 1100 and 1300 dynes per cm. the eutectic graphite, along with graphite rosettes, are predominant. Measurements show that C diffuses more rapidly in Mg-treated cast irons and steels than in ordinary gray cast iron. This explains the short annealing period needed for ferritization of spheroidal cast iron.

16728 The Transformation Kinetics of Uranium-Zirconium Alloys Containing 50 and 60 Wt Pct Uranium. John J. Kearns. *Westinghouse Electric Corporation, Atomic Power Division (U. S. Atomic Energy Commission)*, WAPD-T-417, Nov. 1956, 36 p. (UF767 Un3.1wa Contin.)

Dilatometric, hardness, metallographic, and X-ray diffraction data were obtained on samples quenched from the γ-solution temperature directly to the isothermal-transformation temperature.

16729* (Russian.) Metallographic Investigation of Carbide Phases in High-Speed Steel. **Metallograficheskoe issledovanie karbidnykh faz v bystrorezhushchikh staliakh.** M. S. Chaadaeva. *Zavodskaia Laboratoriia*, v. 23, July 1957, p. 811-813.

Method of pickling steels in metallographic study of carbide phases. A 4% aqueous solution of NaOH saturated with $KMnO_4$ and 1% solution of chromic acid are the two main reagents used.

16730* (German.) A_2B Phases of the Cu_2Ca Type and "Laves" Phases in the Systems of Strontium With Palladium, Platinum, Rhodium, and Iridium. **A_2B-Phasen vom Typ Cu_2Ca und Lavesphasen in den Systemen des Strontiums mit Palladium, Platin, Rhodium und Iridium.** Th. Heumann and M. Kniepmeyer. *Zeitschrift für Anorganische und Allgemeine Chemie*, v. 290, May 1957, p. 191-204.

Various binary systems studied microscopically and by X-rays. "Laves" phases of the Cu_2Mg type occur unexpectedly in four phases.

16731* (German.) Measurement of the Diffusion Coefficient and the Solubility of Hydrogen in Aluminum and Copper. **Messung des Diffusionskoeffizienten und der Löslichkeit von Wasserstoff in Aluminium und Kupfer.** Walter Eichenauer and Alfred Pebler. *Zeitschrift für Metallkunde*, v. 48, July 1957, p. 373-378.

16732* (German.) Martensitic Conversion in the Deformation of Quenched $Beta_1$-Brass. **Martensitische Umwandlung bei der Verformung von abgeschrecktem $Beta_1$-Messing.** Erhard Hornbogen, Armin Segmüller, and Günter Wassermann. *Zeitschrift für Metallkunde*, v. 48, July 1957, p. 379-384.

Under tensile stress β_1-brass single crystals transform into martensite crystals. This transformation occurs by displacement of the habitus plane. The structure of the new phase α_1 is tetragonal and may be described as ordered α-brass of the type CuAu. In the transition stage between β_1 and α_1 an unknown structure of low symmetry is observed (α_2).

16733* (German.) The Bismuth-Copper-Magnesium System. **Über das System Wismut-Kupfer-Magnesium.** Raymund Dobbener. *Zeitschrift für Metallkunde*, v. 48, July 1957, p. 413-417.

Analogous to the Sb-Cu-Mg system. Magnesium has a higher affinity to Bi than to Cu.

16734* (German.) Equilibrium Relationships in the Copper-Beryllium-Aluminum System. **Gleichgewichtsverhältnisse im System Kupfer-Beryllium-Aluminium. I.** The Ternary Constitutional Diagram. **Das ternäre Zustandsschaubild.** Otto Nickel. *Zeitschrift für Metallkunde*, v. 48, July 1957, p. 417-424.

16735* (Russian.) The Solubility of Thorium in Liquid Zinc. **Rastvorimost' toriia v zhidom tsinke.** M. V. Smirnov, N. G. Illiushchenko, S. P. Detkov, and L. E. Evanovskii. *Zhurnal Fizicheskoi Khimii*, v. 31, May 1957, p. 1013-1018.

Determined from 419-825 C.

See also: **15788** (surface abrasion and hydrogen content of steel); **16031** (Fe-Zn phases in galvanized parts); **16141** (naphthalenesulfonic acids and electrical precipitation of Ni); **16480** (intercrystalline corrosion in welded austenitic Cr-Ni steels); **16481** (diffusion of sulfur into Cu-Al alloys); **16571** (carbide formation during steel tempering); **16585** (crystal orientation and fatigue strength of Fe monocrystals); **16588** (atomic structure and strength of metals); **16619** (strain-aging of steel); **16622** (properties of uranium); **16625** (Zr alloy phase diagrams); **16626** (vacancies and thermal expansion in Pb); **16675** (low temperature cold working in Cu and α brass); **16781** (mass-absorption coefficients for Li).

METALS—POWDER

16736 Effects of Irradiation on Powder Compacts of Uranium and Some Uranium-Base Alloys. J. H. Kittel and S. H. Paine. *Argonne National Laboratory (U. S. Atomic Energy Commission)*, ANL-5664, June 1957, 42 p. (UF767 Un3.1an Contin.)

Both the unalloyed and the alloyed compacts decreased in density under irradiation, and the rate of density decrease was found to depend strongly on the irradiation temperature.

16737* Powder Metallurgy and the Sintering of Iron. A. J. Last. *British Chemical Engineering*, v. 2, Aug. 1957, p. 433-436.

Fundamentals of powder metallurgy; some of the problems of producing iron powders for subsequent processing.

16738* (Russian.) Similarity of Mechanism of Sintering and Roasting of Powder-Metal Materials. **Ob analogii mekhanizmov spekaniia i pripekaniia metallokeramicheskikh materialov.** M. K. Rybal'chenko. *Metallovedenie i Obrabotka Metallov*, 1957, no. 7, July, p. 24-27.

Simultaneous roasting of conglomerate of microscopic powder particles and sintering these particles to the surface of larger metal particles. The mechanism of roasting does not basically differ from the mechanism of sintering.

16739 Furnaces for Sintering and Heat Treating Powder Metal Parts. N. K. Koebel. *Metal Progress*, v. 72, Aug. 1957, p. 65-68.

Furnaces may be of mesh-belt, roller-hearth, or mechanical pusher type, depending on requirements. The batch-type vertical radiant tube furnace is particularly suited for hardening in controlled atmospheres.

16740 Furnace Sintering of Metals and Ceramics. R. L. Harper. *Metal Progress*, v. 72, Aug. 1957, p. 69-72.

Brief notes on temperatures, times and atmospheres for the well-known powders, reasons for vacuum sintering, the handling of mixtures for magnets and electronic ferrites, and metallizing of ceramic bodies so connections can be welded or soldered.

16741* Powder Metallurgy Bibliography for the Years 1950-1952. 47 p. Fansteel Metallurgical Corp., Chicago. (ZTN695 F21p Ref.)

16742 Design for Metal-Powder Parts. Robert Talmage and John Kolb. *Product Engineering*, v. 28, Aug. 1957, p. 183-190.

A review of advantages and limitations of the process adapting the design of parts originally made by other processes; tooling problems.

16743 (German.) Recent Problems in Powder Metallurgy. **Neuzeitliche Probleme der Pulvermetallurgie.** E. M. Onitsch-Modl. *Schweizer Archiv für Angewandte Wissenschaft und Technik*, v. 23, July 1957, p. 209-215.

Survey of mass-production sintering techniques, powder metallurgical processes, and the theoretical study of the basic principles and causes of sintering since World War II.

NONDESTRUCTIVE TESTING AND QUALITY CONTROL

16744* An Application of Multivariate Quality Control to Photographic Processing. J. Edward Jackson and Robert H. Morris. *American Statistical Association, Journal*, v. 52, June 1957, p. 186-199.

These new variates are used both for short and long range control with some simplifications when the short range procedures are to be handled by production personnel.

16745 Nondestructive Determination and Control of Shallow Carburized Case Depths. Romeo Suffredini. *ASTM Bulletin*, no. 223, July 1957, p. TP140-TP144.

The correlation of liquid-carburized case depths of rifle and shotgun parts with their Rockwell superficial hardness values was investigated in the hope of finding a non-destructive test that would cut costs, save time, and give greater standards of protection than methods of fracture testing and microscopic examinations.

16746* Ultrasonics in the Foundry. J. Jarvis. *British Foundryman*, v. 50, pt. 8, Aug. 1957, p. 400-406.

Ultrasonic testing is rapid, is capable of detecting deeply situated defects, and it does not involve any damage to the casting. This is particularly important where extensive machining operations are involved.

16747 New Methods of Quality Control With Special Reference to Their Automation. I. Electromagnetic Methods of Nondestructive Testing. F. Förster, K. Sprungmann, A. Michalski, and W. Koch. *Henry Brutcher Translation No.* 3956, 26 p. (From *Technische Mitteilungen*, v. 50, no. 4, 1957, p. 162-174.) Henry Brutcher, Altadena, Calif.

Summaries of six papers dealing with eddy-current testing, magnetic leakage flux methods, magnetography, and Magnatest Q.

16748* Nondestructive Testing of Nuclear Reactor Components. John N. Wilson. *ISA Journal*, v. 4, Aug. 1957, p. 322-325.

Use of ultrasonic, eddy current, X-ray, and autoradiographic detectors.

16749 Nucleonic Radiation Gage Control. *Journal of Metals*, v. 9, Aug. 1957, p. 1041.

The use of gamma radiation from radioactive isotopes for gage control in a continuous hot strip mill.

16750 An Exposure Calculator for Isotope Radiography. T. A. Cosh. *Journal of Scientific Instruments*, v. 34, Aug. 1957, p. 329-332.

Factors affecting exposure time in γ radiography using radon, Co-60, Ir-192, Tm-170, and Cs-137 are correlated so that for any stated conditions the exposure time is rapidly determined.

16751 The Control of Quality in Automatic Production. J. Loxham. *Machinery (London)*, v. 91, Aug. 9, 1957, p. 317-326.

16752* Control of Quality in Automation. II. John Loxham. *Metalworking Production*, v. 101, Aug. 2, 1957, p. 1319-1325.

Unstable processes and description of recent developments in automatic control equipment.

16753 (Czech.) Non-Destructive Testing of Metals by Means of Turbulent Electric Currents. **Nedestruktivní zkoušení kovů vířivými proudy.** M. Jančová. *Strojírenství*, v. 7, July 1957, p. 531-534.

A theory of non-destructive testing of bars or pipes of light and non-ferrous metals. Testing is performed by pulling the test bar through the measuring coil. The conductivity allows estimation of heat treatment, corrosion, the layer of oil, paint, or another metal in the surface as well as other chemical and physical qualities on which conductivity depends.

16754* (Russian.) Color Defect Detection. **Tsvetnoi metod defektoskopii.** N. V. Khimchenko. *Zavodskaia Laboratoriia*, v. 23, July 1957, p. 803-806.

Method of color defect detection and its advantages in checking defects in metallic articles.

See also: **16395** (color defect detection); **16535** (surface examination).

NUCLEAR PHYSICS, NUCLEONICS, AND RADIATION

16755* (English.) **Neutron Polarization and Angular Distributions in (p,n) Reactions and Nuclear Optical Model.** J. Sawicki. *Acta Physica Polonica*, v. 16, nos. 1-2, 1957, p. 93-117.

The Coulomb effect of the incident proton wave results in a flattening of the angular distributions and gives smaller absolute values for the polarization. The maximum negative polarization, approximately 65%, occurs at a scattering angle of about 100°. Further extensions of the model are discussed.

16756 Design and Testing of Containment Provisions for the Engineering Test Reactor. A. L. Lindsay, Jr. *American Society of Mechanical Engineers, Paper No.* 57-SA-23, 1957, 7 p. (TJ1 Am35p Contin.)

A discussion of the reactor building and its ventilation system, the entire primary coolant loop and radioactive-waste disposal, together with alternate arrangements and comparisons of cost.

16757* (German.) Our Knowledge About Elementary Particles. **Unsere Kenntnisse über Elementarteilchen.** E. Lohrmann and H. Winzeler. *Angewandte Chemie,* v. 69, July 15, 1957, p. 449-456.

Characteristics and roles of the electron, proton, neutron, positron, neutrino, γ-quantum, light and heavy mesons, and hyperons.

16758* (French.) Using Nuclear Emulsions in Studying β-Radiations. **L'utilisation des émulsions nucléaires dans l'étude des radiations β.** Georges Marguin. *Annales de Physique,* v. 2, ser. 13me, May-June 1957, p. 318-368.

Technique of using emulsions sensitive to electrons. Measuring electron energy and diffusion. Comparative transmission of electrons and positrons through thin metal films.

16759 Frequency Response Measurements of the EBWR Automatic Steam By-Pass Valve Control System. J. A. DeShong, Jr. and E. S. Beckjord. *Argonne National Laboratory (U. S. Atomic Energy Commission),* ANL-5726, June 1957, 18 p. (UF767 Un3.1an Contin.)

Description of pressure signal generator which was developed to perform several measurements.

16760 Two-Group Diffusion Theory for a Ring of Cylindrical Rods. R. Avery. *Argonne National Laboratory (U. S. Atomic Energy Commission),* ANL-5729, June 1957, 21 p. (UF767 Un3.1an Contin.)

The results are obtained in terms of a Fourier expansion of the angular dependence of the flux about each rod. The order of the critical determinant is equal to twice the number of angular terms retained.

16761 Tables of Charged Particle Penetrabilities. J. P. Schiffer. *Argonne National Laboratory (U. S. Atomic Energy Commission),* ANL-5739, June 1957, 59 p. (UF767 Un3.1an Contin.)

16762 The Ratio of the (n,γ) to (n, 2n) Cross Section for Thorium-232 Bombarded With Fission Neutrons. R. A. Hasse and P. Kafalas. *Argonne National Laboratory (U. S. Atomic Energy Commission),* ANL-5762, July 1957, 25 p. (UF767 Un3.1an Contin.)

16763 EBWR Physics Experiments. J. A. Thie. *Argonne National Laboratory (U. S. Atomic Energy Commission),* ANL-5711, July 1957, 31 p. (UF767 Un3.1an Contin.)

The results of a number of zero power experiments, as well as the initial power generation experiments, are reported. These include critical mass determinations, control rod calibrations, void and temperature coefficient measurements, determinations of reactivity compensated by steam voids, and the effect of boric acid and control rods on power generation. A low-power, low-pressure, oscillation phenomenon is described.

16764 Estimation of Fission Product Spectra in Discharged Fuel From Fast Reactors. Leslie Burris, Jr. and Ira G. Dillon. *Argonne National Laboratory (U. S. Atomic Energy Commission),* ANL-5742, July 1957, 56 p. (UF767 Un3.1an Contin.)

Calculations are based on recent yield data for fission of U and Pu. Derived values of total curies and energy dissipation rates as functions of operating time and cooling time are presented.

16765* (Russian.) Choice of Coolant for the Useful Extraction of Heat From a Reactor. **Vybor parametrov teplonositelia pri otvode i ispol'zovanii tepla ot reaktorov.** M. A. Zimin. *Atomnaia Energiia,* v. 3, July 1957, p. 5-10.

Conditions in selecting the temperatures of a heat transfer agent at the entrance and exit of a reactor. Admissible temperature of the material covering the head liberating elements. Parameters of the steam developed. Coefficient of heat used.

16766* (Russian.) Neutron Distributions in Media of Given Properties. **O raspredelenii neitronov v sredakh s zadannymi svoistvami pri tsilindricheskoi granitse razdela.** A. E. Glauberman and I. I. Tal'ianskii. *Atomnaia Energiia,* v. 3, July 1957, p. 23-27.

Solving the cylindrical symmetrical problem of neutron distribution from a point source in a medium divided into two areas of different neutron properties. Application.

16767* **Neutrons From Deuteron Bombardment of Boron.** J. R. Bird and R. H. Spear. *Australian Journal of Physics,* v. 10, June 1957, p. 268-275.

Investigated dependence of resolution on various experimental factors; the angular distribution of the neutron group leading to the 7.66 m.e.v. state in ^{13}C was studied.

16768 Liquid Metal Fuel Reactor Experiment. Quarterly Progress Report. *Babcock & Wilcox Company (U. S. Atomic Energy Commission),* BAW-1004, Nov. 1956-Feb. 1957, 161 p. (UF767 Un3.1ba Contin.)

16769 Testing Program Report for the Liquid Metal Fuel Reactor Experiment. *Babcock & Wilcox Company (U. S. Atomic Energy Commission),* BAW-1009, Apr. 1957, 35 p. (UF767 Un3.1ba Contin.)

Description of operations and tests to be performed.

16770 Liquid Metal Fuel Reactor Experiment Objectives and Design Parameters. *Babcock & Wilcox Company (U. S. Atomic Energy Commission),* BAW-1011, May 1957, 9 p. (UF767 Un3.1ba Contin.)

16771 Liquid Metal Fuel Reactor Experiment. The Economic Comparison of a Large-Scale LMFR Breeder & Burner. *Babcock & Wilcox Company (U. S. Atomic Energy Commission),* BAW-1012, May 1957, 15 p. (UF767 Un3.1ba Contin.)

16772 Liquid Metal Fuel Reactor Experiment. Preliminary Hazards Report. G. R. Thomas, et al. *Babcock and Wilcox Company (U. S. Atomic Energy Commission),* BAW 1017, July 1957, 123 p. (UF767 Un3.1ba Contin.)

A description of the reactor, containment, and plant design is given. The associated environmental hazards are analyzed to illustrate the degree of containment necessary, and to aid in the selection of a site.

16773 The Effectiveness of Control-Rod Materials. Russell W. Dayton. *Battelle Memorial Institute (U. S. Atomic Energy Commission),* BMI-1196, June 1957, 32 p. (UF767 U3.b Contin.)

Factors involved in determining effectiveness; absorption for various materials for a range of neutron energies; method of computing effectiveness; limitations of cross-section information; factors causing loss of effectiveness.

16774 Model Studies of Flow in the Thermal-Shield Passages of the PWR Reactor. Lawrence J. Flanigan and Herbert R. Hazard. *Battelle Memorial Institute (U. S. Atomic Energy Commission),* BMI-1198, June 1957, 39 p. (UF767 U3.b Contin.)

Detailed studies of flow in shield passages showed that there may be considerable variation in both velocity and direction of flow in the outer channel, resulting from asymmetrical flow conditions in the lower plenum. Mass transfer exists throughout the cooling annuli under all operating conditions; therefore, no stagnant regions are present and adequate cooling will be provided.

16775* (German.) What Are the Differences Between a Fuel Fired and a Nuclear Power Station? **Wodurch unterscheidet sich ein brennstoffgefeuertes Kraftwerk von einem Kernkraftwerk?** H. Bachl. *Brennstoff-Wärme-Kraft*, v. 9, Aug. 1957, p. 357-366.

A schematic view is presented of the transformation of energy with chemical energy or nuclear fission as a source of heat. Diagrams for the electrical auxiliary power, water supply, and the primary cycle are shown for the example of a nuclear power plant. The technically possible combinations of different reactors with the most important thermal power cycles. The overall efficiencies are given for nuclear power stations as a function of the entry and exit temperatures of the coolants.

16776 Critical Assemblies of Light Water Moderated, Slightly Enriched Uranium Rod Lattices at Brookhaven. Hazards Report. Herbert Kouts. *Brookhaven National Laboratory (U. S. Atomic Energy Commission)*, BNL-3145, Feb. 1956, 24 p. (UF767 Un3.1bn Contin.)

16777 Nuclear Safety Considerations in Reprocessing Plant Design. Norman Ketzlach. *Chemical Engineering Progress*, v. 53, July 1957, p. 357-360.

Safety aspects of the design and operation of reactor fuel separation plants are presented.

16778 Some Aspects of Atomic Energy. The Influence of Radiation on Plant Design. A. S. White. *Chemistry & Industdy*, 1957, no. 30, July 27, p. 1020-1027.

16779* Dynamics and Control of Nuclear Power Plants. A. B. Van Rennes, J. C. Simons, Jr., and T. S. Gray. *Communication and Electronics*, 1957, July, p. 279-285.

16780* A Resistance-Temperature Detector for Nuclear Reactor Service. F. R. Sias. *Communication and Electronics*, 1957, July, p. 363-365.

Design of a device with very fast response and high power dissipation ability under flow conditions.

16781* (French.) Lithium Mass-Absorption Coefficients. **Coefficients d'absorption massique du lithium.** Philippe Olmer and Georges Champier. *Comptes Rendus*, v. 245, July 29, 1957, p. 542-543.

Direct measurements of high purity Li for the CuKα radiation and its second harmonic.

16782 Reactivity Comparisons Between Cobalt and Lithium-Aluminum Alloy. Harold R. Fike. *E. I. du Pont de Nemours & Co., Savannah River Laboratory, Technical Division (U. S. Atomic Energy Commission)*, DP-208, Mar. 1957, 16 p. (UF767 Un3.1dp Contin.)

The equivalence of neutron absorption in slugs of Li-Al alloy and in slug assemblies containing Co in various configurations was determined by means of reactivity measurements in the Standard Pile.

16783 The Effects of Nuclear Weapons. Samuel Glasstone, editor. 579 p. 1957. United States Atomic Energy Commission. Available from Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. (UF767 Un3.2e)

Description of basic phenomena and the most recent data obtained from Eniwetok and Nevada tests.

16784* (German.) New Points of View and Possibilities of Thermodynamic Design of Atomic Power Plants. **Neue Gesichtspunkte und Möglichkeiten der thermodynamichen Auslegung von Atomkraftwerken.** L. Heller. *Energietechnik*, v. 7, June 1957, p. 255-263.

Discusses problems connected with determination of the most efficient thermal cycle, and the optimum combination of nuclear power plants and the continued use of customary fuels.

16785 United States' Sea Disposal Operations. A Summary to December 1956. Arnold B. Joseph. *Engineering Development Branch, Division of Reactor Development (U. S. Atomic Energy Commission)*, WASH-734, Aug. 1957, 14 p. (UF767 Un3.1w Contin.)

The extent of disposal operations including a summary of types of packaging used, and of places where the wastes are dumped. The status of related oceanographic research (1956) is briefly touched upon.

16786* Canada's NRU Reactor. F. W. Gilbert. *Engineering Journal*, v. 40, Aug. 1957, p. 1115-1123.

Description, design, and operation of the presently most powerful neutron-flux producer.

16787* Remote Handling Facilities at Chalk River, Ontario. A. S. Bain. *Engineering Journal*, v. 40, Aug. 1957, p. 1129 + 5 pages.

The construction, operation, and approximate cost of an intermediate level remote control handling cell are reported. Shielding experiments using Co^{60} sources are described.

16788* The Short-Lived Radioactive Isotopes. Milton A. Rothman. *Foote Prints*, v. 29, no. 1, 1957, p. 3-14.

A study of the unique properties of the isotopes may lead to the fundamental laws which describe the forces that hold the nucleus together.

16789 Measurement of the Scatter Component From a Kilocurie Cobalt-60 Source. Leonard R. Solon, Keran O'Brien, and Hugo Di Giovanni. *Health and Safety Laboratory, New York Operations Office (U. S. Atomic Energy Commission)*, NYO-2065 June 1957, 13 p. (UF767 U3ny Contin.)

Corroborative measurements of dose rate were made with a graphite-walled CO_2 filled ionization chamber. The point source measurements were numerically integrated over the plane to obtain the relative contribution of scatter to the total radiation.

16790* Decay of Samarium-153. M. C. Joshi, B. N. Subbarao, and B. V. Thosar. *Indian Academy of Sciences, Proceedings*, v. 45, sec. A, June 1957, p. 390-401.

The internal conversion coefficient α_k has been determined for 102 Kev. and 70 Kev. *gamma*-rays. The relative intensities of the three *beta*-ray branches have been determined. A weak *gamma*-ray of energy 83 Kev. has been found and can be interpreted as a transition to the ground state from the first rotational level in Europium-153. The multipole order and character of the 102 Kev. transition is discussed.

16791* Investigations of Tritium Bremsstrahlung as a Means of Determining Sulphur and Tetra-Ethyl Lead in Hydrocarbons. M. M. Kannuna. *Institute of Petroleum, Journal*, v. 43, July 1957, p. 198-202.

Uses counting techniques to record the X-rays from the hydrocarbon cell.

16792* Dounreay Atomic Energy Establishment. *Instrument Practice*, v. 11, July 1957, p. 732-737.

Differences between the Dounreay and Calder Hall installations.

16793 Preliminary Investigations for an Advanced Engineering Test Reactor. O. J. Elgert, C. F. Leyse, and D. G. Ott. *Internuclear Company, Inc. (U. S. Atomic Energy Commission)*, AECU-3427, Feb. 1957, 124 p. (UF767 U3au Contin.)

A group of seven separately cooled and controlled reactors assembled in a common shield are proposed to meet the test facility requirements. Each of the reactors consists of the central test thimble, surrounded consecutively by an H_2O annulus, reactor core, and D_2O reflector. The estimated total power of the seven reactors is about 450 MW when the neutron flux requirements are met in all the test holes.

16794 Production of Carrier-Free Mg^{28} From Aluminium. J. Hudis. *Journal of Inorganic and Nuclear Chemistry*, v. 4, nos. 5-6, 1957, p. 237-238.

The practical threshold for the reaction is approximately 35 MeV and the cross-section with 41 MeVα particles is near 0.2 mb.

16795 The Absolute Yield of Cs^{137} in Fast-Neutron Fission of U^{235} and Pu^{239}. P. Kafalas and C. E. Crouthamel. *Journal of Inorganic and Nuclear Chemistry*, v. 4, nos. 5-6, 1957, p. 239-244.

The Cs^{137} was determined by absolute β counting with an end-window proportional counter. The yields were found to be 6.87% and 7.45% for U^{235} and Pu^{239}, respectively. These values are based on a Cs^{137} half-life of 32.6 years.

16796 Solution of Some Nuclear Reactor Problems by the Resistance-Network Analogue Method. II. Representation of Two Velocity Groups. G. Liebmann. *Journal of Nuclear Energy*, v. 5, no. 2, 1957, p. 169-185.

An iterative process of readjusting currents fed into the analog leads to solutions in which the neutron fluxes can be determined to better than 1%, and the critical neturon multiplication constant k to better than 0.1%.

16797 The Energy Dependence of the Fission-Neutron Yield per Neutron Absorbed in U^{233} Over the Range of 0.025-2.2 eV. J. E. Sanders, H. M. Skarsgard, and C. J. Kenward. *Journal of Nuclear Energy*, v. 5, no. 2, 1957, p. 186-191.

The energy dependence of ν, the fission neutron yield per neutron absorbed in U^{233} was measured from 0.025 to 2.2 e.v. using a crystal spectrometer. Up to 1.3 e.v. ν was found to remain within ± 2% of its value at thermal energies; above 1.3 e.v. ν decerases and at 2.16 e.v. has fallen to 80% of its thermal value.

16798 The Slow-Neutron Cross-Section of Graphite. P. A. Egelstaff. *Journal of Nuclear Energy*, v. 5, no. 2, 1957, p. 203-209.

16799 Effective Fission Cross-Sections of ^{233}U, ^{235}U, ^{239}Pu, and ^{240}Pu in the Neutron Energy Range 30 keV-5MeV. G. A. Dorofeev and Y. P. Dobrynin. *Journal of Nuclear Energy*, v. 5, no. 2, 1957, p. 217-225. (Translated from *Atomnaia Energiia*, v. 2, p. 10, 1957.)

16800* (French.) On the γ Radiation Emitted by the Ra*D* → Ra*E* Transmutation. **Sur le rayonnement γ émis au cours de la transmutation Ra*D* → Ra*E*.** Marcel Frilley and Manuel Valadares. *Journal de Physique et le Radium*, v. 18, July 1957, p. 468-473.

Nine lines of conversion electrons of the γ radiation 46,503 ± 0.015 k.e.v. from Ra*D* were observed by means of a 180° magnetic spectrograph with pre-acceleration. Their relative intensities were determined. Some crystalline diffraction spectra of γ rays and of *L*-photons were obtained.

16801 Two-Space-Dimension Multigroup Analysis of a Moving-Fuel Reactor. E. L. Wachspress. 2nd Ed. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission)*, KAPL-1642, Apr. 1955, 60 p. (UF767 Un3.1ka Contin.)

Analysis of a three-cylinder and an eight-cylinder high-pressure water-moderated moving-fuel reactor. Results are presented with regard to fuel loading, reactivity, flux distributions, xenon effects, temperature coefficients, and other nuclear parameters. The nuclear feasibility of any particular reactor is dependent upon the design specifications. A casualty condition control requirement led to the need for a minimum of eight control cylinders.

16802 High Intensity Gamma Irradiation Facilities at the Knolls Atomic Power Laboratory. Samuel S. Jones. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission)*, KAPL-1773, Apr. 1957, 36 p. (UF767 Un3.1ka Contin.)

Information is presented concerning the structure, operation, and radiation fields of two high intensity cobalt-60 gamma irradiation facilities. A cylindrical 580-curie source is used in a mobile lead-shielded facility. A second source consists of 3440 curies in ten separate capsules.

16803 Development of Zircaloy-Clad, Discrete Burnable Poison Elements for S3G/S4G. G. F. McKittrick and W. A. Neisz. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission)*, KAPL-1726, June 1957, 29 p. (UF767 Un3.1ka Contin.)

A discrete Zr burnable poison element was successfully fabricated. Because of damage incurred as a result of irradiation, however, it is not usable for the S3G/S4G reactors.

16804 Delayed Neutrons From Fissionable Isotopes of Uranium, Plutonium, and Thorium. G. R. Keepin, T. F. Wimett, and R. K. Zeigler. *Los Alamos Scientific Laboratory (U. S. Atomic Energy Commission)*, LA-2118, July 1957, 54 p. (UF767 U3La Contin.)

Period and abundance values for various nuclides are compared and several mechanisms for perturbation of measured delayed neutron parameters are discussed.

16805 A Study of Reactor Hazards. M. M. Mills. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-31 (Del.), Dec. 1949, 157 p. (UF767 Un3.1na Contin.)

For the power reactors that have been built or are presently contemplated, an adequately gas-tight reactor building can remove the public hazard. Adjustment of the design parameters as indicated in this report may significantly minimize the intensity of a reactor catastrophe.

16806 SRE Instrumentation and Control. R. J. Hall. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-1639, May 1956, 83 p. (UF767 Un3.1na Contin.)

Description and operation of components and equipment.

16807 Analysis of the Biological Shield of the Sodium Reactor Experiment. A. R. Vernon. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-1949, June 1957, 26 p. (UF767 Un3.1na Contin.)

The computations performed to deterimne the radiation leakage from the Sodium Reactor Experiment biological shield are described. The formulas and approximations used are probably adequate for analysis of most large stationary reactors, but are generally unsuitable for mobile reactors except for preliminary estimates.

16808 Sodium Graphite Reactor Quarterly Progress Report January-March, 1957. R. W. Dickinson and V. R. DeMaria. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-1941, July 1957, 54 p. (UF767 Un3.1na Contin.)

Full-scale SGR; deterimnation of SRE power and temperature coefficients of reactivity; development of hot cell facilities and handling techniques; metallurgy of SGR fuels.

16809 Flux Distribution for a Finite Cylindrical Bare Homogeneous Thermal Reactor With a Partially Inserted Control Rod. E. J. Betinis. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-1963, July 1957, 19 p. (UF767 Un3.1na Contin.)

One-group diffusion theory is employed to determine the flux for a large but finite cylindrical bare homogeneous reactor with a control rod inserted partially along the axis of the reactor. A critical equation is derived for the buckling.

16810 The Transfer Function of a Water Boiler Reactor. R. E. Skinner and D. L. Hetrick. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-1948, Aug. 1957, 42 p. (UF767 Un3.1na Contin.)

The power and temperature transfer functions for a water boiler reactor are obtained for the case of groups of delayed neutrons including the effects of temperature and radiolytic gas generation. A number of asymptotic and approximate expressions are given. The derivation and limitations of the space-independent reactor kinetics equations used are discussed briefly.

16811 The Determination of Reactor Transfer Functions From Measurements at Steady Operation. M. N. Moore. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-1972, Aug. 1957, 16 p. (UF767 Un3.1na Contin.)

It is possible to show that the square of the modulus of the reactor transfer function is proportional to the Fourier transform of the auto-correlation function for power noise in the reactor. It is possible to measure both power and temperature coefficients. If the reactor is periodically monitored during its operation, long term changes can also be measured.

16812 Annual Program Report to the AEC Research Division for the Period Ending June 30, 1956. *Nuclear Metals, Inc. (U. S. Atomic Energy Commisison)*, NMI-1170, Feb. 1957, 145 p. (UF767 Un3.1nm Contin.)

Radiation damage studies; evaporation from the surface of irradiated metal; effects of radiation on a Cu-Fe precipitation-hardening alloy; internal friction of extruded Be.

16813* Studies on the Long-Lived Activities of Europium. S. K. Bhattacherjee and Shree Raman. *Nuclear Physics*, v. 4, Aug. 1957, p. 44-60.

X-gamma and γ-γ coincidence experiments were carried out by employing pulse-height selection; β-γ coincidence were recorded by using an anthracene crystal spectrometer.

16814* Soft γ-Rays From the Capture of Thermal Neutrons by Nuclei. I. V. Estulin, L. F. Kalinkin, and A. S. Melioransky. *Nuclear Physics*, v. 4, Aug. 1957, p. 91-111.

A luminescent spectrometer was used to measure the energies and absolute intensities of the γ-quanta emitted by Co^{59}, Rh^{103}, I^{127}, Sm^{149}, Au^{197}, and Hg^{199} nuclei following the capture of thermal neutrons. The γ-lines in the 50-500 k.e.v. energy range detected in the present work can be ascribed to transition from the lower excited states of the investigated nuclei.

16815* The Longitudinal Angular Dependence of the Photoelectric Effect and Its Influence on the Determination of Gamma Ray Intensities. Sölve Hultberg and Tihomir Novakov. *Nuclear Physics*, v. 4, Aug. 1957, p. 120-124.

The study of photoelectron lines as a precise method for determining relative γ-ray intensities was applied to the decay of Bi^{208} where relative intensities of about 20 γ-rays have been determined with an instrumental resolution of 0.4% at high energies.

16816* Possible Vibrational Levels in Dy^{160}. Ove Nathan. *Nuclear Physics*, v. 4, Aug. 1957, p. 125-144.

The level scheme is discussed and it is suggested that the states at 964 and 1047 k.e.v. may possibly belong to a rotational band associated with electric quadrupole vibrations and that the states at 1262 and 1359 k.e.v. may belong to a rotational band associated with electric octupole vibrations.

16817* The Energy Levels of Pb^{206}. M. J. Kearsley. *Nuclear Physics*, v. 4, Aug. 1957, p. 157-170.

The energy levels are calculated on the shell model, regarding Pb^{206} as two holes in the double closed shell nucleus Pb^{208}. The single hole energies are derived from data on Pb^{207} and interaction energies are calculated using harmonic oscillator wave functions and a Yukawa potential.

16818* Underwater Mechanical Treatment for Plate-Type Fuel Elements. J. A. Marsh and D. Humphreys. *Nuclear Power*, v. 2, Aug. 1957, p. 331-333.

Surplus sheathing material on fuel elements is milled and sheared off before chemical processing.

16819 Nuclear Power Engineering. Henry C. Schwenk and Robert H. Shannon. 319 p. 1957. McGraw-Hill, New York. (TK9145 Sch98n)

Design, construction, and operation of nuclear power plants.

16820 Effects of Irradiation on Some Corrosion-Resistant Fuel Alloys. J. H. Kittel, S. Greenberg, S. H. Paine, and J. E. Draley. *Nuclear Science and Engineering*, v. 2, July 1957, p. 431-449.

Observations were made of irradiation-induced length changes in specimens of the alloys as influenced by the method of fabrication and heat treatment, and of changes in aqueous corrosion resistance.

16821 Radiation-Induced Decomposition of Thorium Nitrate Solutions. J. W. Boyle and H. A. Mahlman. *Nuclear Science and Engineering*, v. 2, July 1957, p. 492-500.

Above was studied as a function of concentration, type of radiation, temperature, and total energy absorbed.

16822 UO_2-NaK Slurry Studies in Loops to 600 C. B. M. Abraham, H. E. Flotow, and R. D. Carlson. *Nuclear Science and Engineering*, v. 2, July 1957, p. 501-512.

With the addition of small amounts of U metal to the system, the slurry is stabilized and circulates successfully at 600 C. Uranium oxide in Nak alloy can be potential reactor fuels if not affected by fission products.

16823 French Reactor Instrumentation. J. Weill. *Nucleonics*, v. 15, Aug. 1957, p. 45-49.

Automatic control system, γ compensated ion chambers, and reactivity computers.

16824 Plasma Reactor Promises Direct Electric Power. S. A. Colgate and R. L. Aamodt. *Nucleonics*, v. 15, Aug. 1957, p. 50-55.

A proposed reactor converts fission energy directly into electricity by causing ionized U^{235} gas to interact with a magnetic field. Estimated operating conditions look extreme but not impossible.

16825 Special Power Excursion Reactor Test III. T. R. Wilson. *Nucleonics*, v. 15, Aug. 1957, p. 68-71.

16826 Resistance Thermometer for Nuclear-Reactor Service. F. Ralph Sias. *Nucleonics*, v. 15, Aug. 1957, p. 75 + 5 pages.

Specifications and design data.

16827 Glass Fibers—A New Form for Reactor Fuels. P. Harteck and S. Dondes. *Nucleonics*, v. 15, Aug. 1957, p. 94-98.

Uranium, Pu, and Th can be incorporated as oxides in glass fibers to make nuclear-reactor fuels having unique properties.

16828 Reactors on the Line. Army Package Power Reactor. *Nucleonics*, v. 15, Aug. 1957, 6 p. (Insert).

Design data for army package power reactor.

16829* (English.) The Decay of ^{185}W. I. R. Williams and M. W. Johns. *Nuovo Cimento*, v. 6, ser. 10, no. 1, July 1957, p. 18-22.

The main β decay proceeds by a first forbidden transition of allowed shape to the ground state of Re^{185}. No other mode of decay with intensity greater than 0.15% exists.

16830* (English.) An Analysis of 419 τ-Meson Decays. M. Baldo-Ceolin, et al. *Nuovo Cimento*, v. 6, ser. 10, no. 1, July 1957, p. 84-97.

Analysis of a homogeneous sample of 419 τ-decays found in nuclear emulsions exposed to the Berkeley bevatron shows that the τ-decay is nearly isotropic, corresponding in the Dalitz treatment to zero spin and negative parity.

16831* (English.) Nuclear Interactions of Neutral K-Mesons of Long Lifetime. M. Baldo-Ceolin, et al. *Nuovo Cimento*, v. 6, ser. 10, no. 1, July 1957, p. 130-143 + 3 plates.

16832* (English.) Contribution to Elastic Scattering From Inelastic Processes: Application to High-Energy Electron Scattering From Hydrogen and Deuterium. H. S. Valk. *Nuovo Cimento*, v. 6, ser. 10, no. 1, July 1957, p. 173-186.

An expression is derived in first born approximation for the correction to high-energy elastic electron-nucleus scattering arising from the existence of non-radiative inelastic processes. The magnitude of this correction is estimated for electron-proton and electron-deuteron scattering.

16833* (English.) Directional Correlations of β-Rays. I. Hauser. *Nuovo Cimento (Supplemento)*, v. 5, ser. 10, no. 1, 1957, p. 182-221.

Derivation of formulas for the directional correlation between β-particles and any succeeding nuclear radiation.

16834* (English.) A Survey of Atomic Constants. J. A. Bearden and J. S. Thomsen. *Nuovo Cimento (Supplemento)*, v. 5, ser. 10, no. 2, 1957, p. 267-360.

Reviews earlier work.

16835 Recent Fission Process Studies With Monoenergetic Neutrons (Tripartite Conference on Nuclear Constants—January 10-12, 1956). J. L. Fowler. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, CF-56-2-106, Feb. 1956, 17 p. (UF767 Un3.1cf Contin.)

The fission cross sections of U^{233}, U^{234}, U^{236}, and U^{238} have been measured in terms of U^{235} cross section from a few k.e.v., or the effective threshold to 4 m.e.v. Monoenergetic neutrons were from the V(p,n), Li(p,n), and T(p,n) reactions produced by protons accelerated by electrostatic generators.

16836 Homogeneous Reactor Project Quarterly Progress Report for Period Ending July 31, 1956. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2148(Del.), Oct. 1956, 145 p. (UF767 U3o Contin.)

16837 An Analysis of Power Reactor Fuel Reprocessing. F. L. Culler, Jr., R. E. Blanco, H. E. Goeller, and C. D. Watson. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2265(Del.), Mar. 1957, 133 p. (UF767 U3o Contin.)

An analysis of the projected economics and processing capacity requirements for a power reactor fuel reprocessing industry based on the recovery of fertile and fissionable materials from presently proposed power reactors within the confines of the continental United States for the next five to ten years. A summary of results of power reactor reprocessing chemical and engineering development at Oak Ridge National Laboratory from July 1955 through December 1956 is given.

16838 Homogeneous Reactor Project Quarterly Progress Report for Period Ending January 31, 1956. H. F. McDuffie and V. K. Hill, compilers. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2057(Del.), Apr. 1957, 141 p. (UF767 U3o Contin.)

16839 Isolation of Carrier-Free Mn^{54} and I^{125} From Cyclotron Targets. H. T. Russell. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2330, July 1957, 2 p. (UF767 U3o Contin.)

Chemical processing for recovery and purification of carrier-free I^{125} and Mn^{54} produced by bombardment of isotopically enriched Te^{128} and Cr^{54} with protons in the ORNL 86-in. cyclotron.

16840 Studies of the Spherical Harmonics Method in Neutron Transport Theory. II. Behavior of the Solution of the Milne Problem With Anisotropic Scattering for L → Infinity. Walter Kofink. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2358, July 1957, 41 p. (UF767 U3o Contin.)

16841 HRP Civilian Power Reactor Conference Held at Oak Ridge National Laboratory, May 1-2, 1957. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, TID-7540, July 1957, 301 p. (UF767 Un3ti Contin.)

A compilation of papers concerning various aspects of homogeneous reactor technology, chemical processing of ThO_2, ThO_2 slurries, reactor fuels, corrosion, and reactor metallurgy.

16842 Uranium-235 Fission-Product Production as a Function of Thermal Neutron Flux, Irradiation Time, and Decay Time. I. Atomic Concentrations and Gross Totals. J. O. Blomeke and Mary F. Todd. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2127, v. 1-2, Aug. 1957, p. 1-211 and 212-426. (UF767 U3o Contin.)

16843 Specifications for Army Package Power Reactor (APPR-1) Fuel and Control Rod Components. R. J. Beaver, R. C. Waugh, and C. F. Leitten. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2225, Aug. 1957, 37 p. (UF767 U3o Contin.)

Final specifications are presented on the stainless steel fuel and control rod components developed for service in the 10 megawatt reactor. Design and material requirements; fabrication procedures.

16844 Operation of the ORNL Graphite Reactor and of the Low-Intensity Test Reactor and Preoperation Activities at the Research Reactor. Annual Report for 1956. H. E. Seagren and J. A. Cox. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2286, Aug. 1957, 21 p. (UF767 U3o Contin.)

Annual Report 1956.

16845 A Preliminary Design Study of a 10 MW Homogeneous Boiling Reactor Power Package for Use in Remote Locations. R. J. Rickert, et al. *Oak Ridge School of Reactor Technology (U. S. Atomic Energy Commission)*, CF-53-10-23, Aug. 1953, 150 p. (UF767 Un3.1cf Contin.)

16846 Boiling Homogeneous Reactor for Power and U^{233} Production. Reactor Design and Feasibility Problem. H. R. Zeitlin, et al. *Oak Ridge School of Reactor Technology (U. S. Atomic Energy Commission)*, CF-54-8-240, Aug. 1954, 172 p. (UF767 Un3.1cf Contin.)

The design of a 500 megawatt single region boiling homogeneous reactor for central-station power, fueled with $UO_2 \cdot ThO_2$ slurried in D_2O is reported, including an analysis of the problems of power removal and control.

16847 Ultimate Homogeneous Reactor. R. A. Thomas, et al. *Oak Ridge School of Reactor Technology (U. S. Atomic Energy Commission)*, CF-54-8-239, Aug. 1954, 227 p. (UF767 Un3.1cf Contin.)

Pertinent features of the UHR are: higher core power density; higher thermal efficiency; constant turbine steam conditions from no load to full load.

16848 Fused Salt Fast Breeder. J. J. Bulmer, et al. *Oak Ridge School of Reactor Technology (U. S. Atomic Energy Commission)*, CF-56-8-204(Del.), Aug. 1956, 214 p. (UF767 Un3.1cf Contin.)

An externally cooled, fused salt, fast breeder reactor producing 700 MW of heat was designed utilizing plutonium as the fuel in a mixture of the chlorides of Na, Mg, U, and Pu. Depleted U is used as the fertile material in a blanket of U oxide in sodium.

16849 Beta Skin-Dose Measurements by Specially Designed Film-Pack Dosimeters. Richard K. Dickey, Louis B. Silverman, and Mary Lee Griswold. *Operation Teapot (U. S. Atomic Energy Commission)* WT-1178A, July 1957, 27 p. (UF767 Un3.1wt Contin.)

Design and construction of film pack and method of reading and interpreting the films. Tables are included which summarize the exposure conditions and results for all the film packs.

16850 Nuclear Calculations for Spert III Zirconium Core. G. A. Cazier and B. L. Hanson. *Phillips Petroleum Co., Idaho Operations Office (U. S. Atomic Energy Commission)*, IDO-16359, Oct. 1956, 30 p. (UF767 Un3.1id Contin.)

Calculated critical radii and masses are given for temperatures of 68, 460, and 650 F, all for a core with 3 foot long fuel assemblies.

16851 An Engineering Description of the Spert-I Reactor Facility. T. R. Wilson. *Phillips Petroleum Co., Idaho Operations Office (U. S. Atomic Energy Commission)*, IDO-16318, June 1957, 43 p. (UF767 Un3.1id Contin.)

The reactor consists of an open vessel containing initially a plate type, uranium-aluminum core with no provision for heat removal or coolant circulation. The reactor is remotely operated from a Control Center approximately ½ mile from the reactor.

16852 Calculated Surface Temperatures for Nuclear Systems and Analysis of Their Uncertainties. R. J. Nertney. *Phillips Petroleum Co., Idaho Operations Office (U. S. Atomic Energy Commission)*, IDO-16343, June 1957, 73 p. (UF767 Un3.1id Contin.)

Hot-channel and hot-spot factors; practical considerations in deriving and applying the factors; numerical examples.

16853 (English.) **Anisotropy and Polarization of Gamma Rays Emitted by Orientated ^{52}Mn Nuclei.** W. J. Huiskamp, A. N. Diddens, J. C. Severiens, A. R. Miedema, and M. J. Steenland. *Physica*, v. 23, July 1957, p. 605-621.

The sign of the nuclear magnetic moment was shown to be positive from the measurement of the circular polarization of the γ-rays. It was concluded from the linear polarization of the γ-rays, that these are all electric quadrupole radiations. Results obtained with aligned nuclei are also reported.

16854 Theory of Inelastic Scattering of Cold Neutrons From Liquid Helium. Michael Cohen and Richard P. Feynman. *Physical Review*, v. 107, ser. 2, July 1, 1957, p. 13-24.

16855 F^{19} Nuclear Magnetic Resonance Line Shapes in CaF_2. C. R. Bruce. *Physical Review*, v. 107, ser. 2, July 1, 1957, p. 43-45.

16856 Free-Induction Decays in Solids. I. J. Lowe and R. E. Norberg. *Physical Review*, v. 107, ser. 2, July 1, 1957, p. 46-61.

A beat structure was found on free-induction decays associated with the pulsed nuclear magnetic resonance of nuclei in rigid lattices. A general quantum-mechanical theory is developed for the shapes of induction decays. Theory is specialized to the case of rigid solids and applied to the magnetic dipolar interactions among the F^{19} nuclei in a fluorite (CaF_2) crystal.

16857 Theory of Low-Energy Electron Scattering by Polar Molecules. Saul Altshuler. *Physical Review*, v. 107, ser. 2, July 1, 1957, p. 114-117.

The total diffusion cross section is calculated for low-energy impact of electrons upon polar molecules in an approximation which treats the molecules as fixed rotators. The amplitude is evaluated and the differential cross section corresponding to fixed orientation of the molecule is then averaged over the Maxwell distribution.

16858 Evidence for Small Deviations From the Allowed Shape in the Comparison of the Beta Spectra of Na^{24} and P^{32}. F. T. Porter, F. Wagner, Jr., and M. S. Freedman. *Physical Review*, v. 107, ser. 2, July 1, 1957, p. 135-138.

16859 Energy Levels of Np^{237} Populated by the Beta Decay of U^{237}. J. O. Rasmussen, F. L. Canavan, and J. M. Hollander. *Physical Review*, v. 107, ser. 2, July 1, 1957, p. 141-154.

Energy levels are identified at 0, 33.20, 59.57, 103.0, 267.5, 332.3, 368.5, and 370.9 k.e.v. and spin and parity assignments are given for all the levels from the γ-ray multipolarity and β-decay information.

16860 Inelastic Neutron Scattering From Rhodium and Niobium. M. A. Rothman, D. M. Van Patter, V. S. Dubey, W. C. Porter, and C. E. Mandeville. *Physical Review*, v. 107, ser. 2, July 1, 1957, p. 155-158.

Gamma rays were observed from the 300- and 365-k.e.v. levels in Rh. Gamma rays of 736- and 957-k.e.v. energy were obtained from Nb. As a result of threshold measurements, these γ-rays are interpreted as representing transitions to the 29-k.e.v. metastable state from levels at 764- and 977-k.e.v. in Nb.

16861 Intensities of X-Rays and γ-Rays in Am^{241} Alpha Decay. L. B. Magnusson. *Physical Review*, v. 107, ser. 2, July 1, 1957, p. 161-170.

16862 Polarization of Bremsstrahlung From Monocrystalline Targets. H. Überall. *Physical Review*, v. 107, ser. 2, July 1, 1957, p. 223-227.

Owing to interference effects, the polarization is considerably increased above its value when amorphous targets are used; moreover, the total emitted bremstrahlung cone has an over-all net polarization with respect to the plane formed by the direction of incidence and the crystal axis. This provides a means of producing partially polarized radiation with an intensity sufficient for performing significant high-energy polarization experiments.

16863 Optical Model for Production of Σ Particles in Nuclei by Negative K Mesons. Richard H. Capps. *Physical Review*, v. 107, ser. 2, July 1, 1957, p. 239-248.

16864 Cross Sections for Antiprotons in Hydrogen, Beryllium, Carbon, and Lead. Bruce Cork, Glen R. Lambertson, Oreste Piccioni, and William A. Wenzel. *Physical Review*, v. 107, ser. 2, July 1, 1957, p. 248-256.

With a liquid H attenuator, the total antiproton-proton cross section at four different energies, 190, 300, 500, and 700 m.e.v. was observed to be 135, 104, 97, and 94 mb. respectively.

16865 Characteristics of π^0 Production From Proton-Proton Collisions Near Threshold. Burton J. Moyer and Robert K. Squire. *Physical Review*, v. 107, ser. 2, July 1, 1957, p. 283-290.

P-state production of the mesons dominates at all energies except those quite close to threshold, where some S-state production can be detected. The total cross section, at an energy where the maximum attainable c.m. meson momentum is $\eta_0 \, Mc$, can be stated as $\sigma(\text{mb}) = 0.02\eta_0^2$ (S state) $+$ $0.57\eta_0^8$ (P state).

16866* (English.) **Some Factors Affecting the Decay of Secondary Electron Emission of Silver-Magnesium Alloys.** Masaki Hirashima and Shoichi Miyashiro. *Physical Society of Japan, Journal*, v. 12, July 1957, p. 770-777.

16867 Fast Neutron Capture Below 1 MeV. The Cross Sections for ^{238}U and ^{232}TH. A. M. Lane and J. E. Lynn. *Physical Society, Proceedings*, v. 70, no. 452A, Aug. 1957, p. 557-570.

Attempts to fit these cross sections in terms of conventional compound nucleus theory, using the existing low energy resonance data to provide numerical values of the widths and other parameters.

16868 The Fission Cross Sections of ^{233}U, ^{235}U, ^{238}U, and ^{239}Pu for Neutrons in the Energy Range 0.030 MeV to 3.0 MeV. W. D. Allen and A. T. G. Ferguson. *Physical Society, Proceedings*, v. 70, no. 452A, Aug. 1957, p. 573-585.

The fission cross sections and ratios were shown to be consistent and a set of best values of the cross sections was computed. The accuracy over most of the range is to about 3% falling to 5% at the extremes.

16869 Neutrino Physics. Frederick Reines and Clyde L. Cowan, Jr. *Physics Today*, v. 10, Aug. 1957, p. 12-18.

Design and construction of equipment used in the study of neutrino particles associated with beta decay.

16870 Diffusion of Uranium Through Graphite. L. D. Loch, J. R. Gambino, and W. H. Duckworth. Paper from "Problems in Nuclear Engineering". v. I. p. 145-150. 1957. Pergamon Press. (TK9006 En34s Over.)

Diffusion rates were determined in the temperature range 3000 to 4350 F. The observations indicated two distinct types of U transport which could be associated with volume diffusion and with migration along pores. To estimate the practical importance of pore migration, the U flow through a graphite wall at 3000 F was measured. With a wall thickness of 0.32 cm., the average flow per unit area was 0.015 mg. per cm. per hr. for a 40 hr. test.

16871* Selection Rule Imposed by Mass Reversal. Tadashi Ouchi. *Progress of Theoretical Physics*, v. 17, June 1957, p. 743-750.

Investigation of the structure of the interactions among the fundamental particles by means of a selection rule based on the new invariance principle. A unified model of interactions for the baryon-meson system is presented and its consistency is proved.

16872 The Prospects of Nuclear Power and Technology. Gerald Wendt. 348 p. 1957. D. Van Nostrand Co., Princeton. (HD9698 W48p)

A report on the peacetime atomic industries.

16873* Chemical Protection Against Ionizing Radiation. I. Sampling Methods for Screening Compounds in Radiation Protection Studies With Mice. A. W. Kimball, W. T. Burnett, Jr., and David G. Doherty. **II. Mercaptoalkylamines and Related Compounds With Protective Activity. III. Mercaptoalkylguanidines and Related Isothiuronium Compounds With Protective Activity.** Raymond Shapira, David G. Doherty, and W. T. Burnett, Jr. *Radiation Research*, v. 7, July 1957, p. 1-34.

16874* The Backscattering of Beta-Particles from Gases. William P. Jesse and John Sadauskis. *Radiation Research*, v. 7, Aug. 1957, p. 167-175.

16875 Selected Papers From the 1st Nuclear Engineering and Science Congress. v. I. Problems in Nuclear Engineering. v. II. Reactor Operational Problems. D. J. Hughes, Stuart McLain, and Clark Williams, editors. 365 and 278 p. 1957. Pergamon Press, New York. (TK9006 En34s Over.)

Volume I includes papers on safety, fuel production, and heat transfer. Volume II deals with recovery of irradiated fuel, handling of plant effluents, experimental low-power assemblies, reactor physics, and control and instrumentation.

16876 (Czech.) Comparison of Thermal Regime of Nuclear Reactors With a Single-Stream and a Double-Stream Flow of the Cooling Medium. **Porovnání tepelnécho rezimu jaderného reaktoru s jednoproudým a dvouproudým průtokem chladicího media.** Jiří Šimonek. *Strojírenství*, v. 7, July 1957, p. 483-487.

Simplified relations of the temperature of the cooling medium, and that of the surface of the fuel elements along the axis of a cylindrical reactor are derived for two different systems of the inflow of the cooling medium. The main point in the comparison is the possibility of obtaining the highest outflow speed of the cooling medium at a given admissible temperature of the surface of the fuel element.

16877 (German.) Physical Bases of Thermal Nuclear Reactors. **Physikalische Grundlagen von thermischen Reaktoren.** R. Berndt. *Technik*, v. 12, July 1957, p. 503-512.

Structure of the atomic nucleus and nuclear reaction. Interaction of the neutrons and the atomic nuclei. Average number of neutrons liberated by absorption of one neutron. Natural U fission. Chain reaction. Deceleration. Reactor with reflector.

16878 Corrosion and Wear Handbook for Water-Cooled Reactors. D. J. DePaul, editor. 293 p. 1957. *U. S. Atomic Energy Commission.* (QC786 Un3.1c)

Background information for engineers and scientists who are encountering for the first time the problems associated with the use of high purity, high temperature water as a reactor coolant. Tabulated data and detailed information for use as reference material for actual design work. Special types of corrosion and application problems involving wear.

16879 A High-Velocity Point on the Range-Energy Curve for Emulsion. Renée B. Feldman. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-3802, June 1957, 7 p. (UF767 U3u Contin.)

Range measurements were made in Ilford G.5 emulsion exposed to a magnetically separated beam of positive K mesons accompanied by pions of the same momentum, 360 Mev/c. The pions had a velocity v=0.92c. Five π-meson tracks, each approximately 34 cm. in length, were measured. The momentum of each particle was also determined. The results were then compared with the Barkas range-energy curve, and found to be 0.5 ± 1.0% higher.

16880 Nuclear-Structure Dependence of Conversion Coefficients in Electric Multipole Transitions. Gösta Nilsson. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-3803, June 1957, 33 p. (UF767 U3u Contin.)

Terms up to the second order in a perturbation expansion in the electromagnetic field are considered.

16881 The Analysis of Hyperfragments From Strange-Particle Interactions. Fred W. Inman. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-3815, June 1957, 64 p. (UF767 U3u Contin.)

16882 Spallation-Fission Competition From the Compound System U^{238} Plus He^4. Thomas Darrah Thomas. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-3791, July 1957, 85 p. (UF767 U3u Contin.)

The results of a series of experiments to study the competition between spallation and fission in the reactions induced in U^{238} with helium ions of energies between 20 and 46 Mev are given. The features of the excitation functions are the lowness of the (α,xn) cross sections compared with cross sections for the same reactions in other heavy elements and the prominence of the (α,pxn) reactions.

16883 Investigation of a Seeded PWR. *Westinghouse Electric Corporation, Atomic Power Division (U. S. Atomic Energy Commission)*, WAPD-ReL(W)-50(Del.), Jan. 1955, 87 p. (UF767 Un3.1wa Contin.)

An interim report on a study of the thermal, hydraulic, and mechanical design aspects of the "seeded reactor" principle as applied to PWR. Annular seed arrangements are presently considered to be the most promising and are discussed in some detail.

16884 Approximate Spatially Separable Flux Calculations. Robert S. Halgas. *Westinghouse Electric Corporation, Atomic Power Division (U. S. Atomic Energy Commission)*, WAPD-TM-47, Mar. 1957, 56 p. (UF767 Un3.1wa Contin.)

16885 Technical Progress Report. Pressurized Water Reactor (PWR) Project for the Period Apr. 24, 1957 to June 23, 1957. *Westinghouse Electric Corporation, Atomic Power Division (U. S. Atomic Energy Commission)*, WAPD-MRP-68, 1957, 102 p. (UF767 Un3.1wa Contin.)

Power plant analysis; components and component materials; control mechanisms; reactor and auxiliaries; core engineering; metallurgy of core materials; chemistry and in-pile loop engineering.

16886 Experimental and Theoretical Study of Critical Slabs. Effect of Different Reflector Arrangements and Compositions. C. E. McFarland and A. D. Voorhis. *Westinghouse Electric Corporation, Atomic Power Division (U. S. Atomic Energy Commission)*, WAPD-169, Apr. 1957, 104 p. (UF767 Un3.1wa Contin.)

Data are presented from critical slab experiments with a thin core of enriched U^{235}, light water, and Zr which were surrounded by reflectors of different compositions and arrangements.

16887* (German.) Linear Kinetics of Homogeneous Reactors. **Zur linearen Kinetik homogener Reaktoren.** Walter Humbach. *Zeitschrift für Angewandte Physik*, v. 9, July 1957, p. 333-335.

Assumes that reactor fluid is turbulent. Shows how natural functions of the reactor intermix and how the characteristic equation for natural periods of oscillation with turbulence is derived from those for periods without turbulence. Further possibilities of the method.

16888* (German.) Secondary Electrons and Photons of μ-Mesons in Solid Materials. **Sekundärelektronen und -photonen der μ-Mesonen in festen Materialien.** K. Ott and H. Preuss. *Zeitschrift für Naturforschung*, v. 12a, June 1957, p. 451-465.

Calculation of integral energy spectra of the electrons and photons accompanying μ-meson components at sea level for C, Fe, and Pb sheets up to 50 g/cm.^{2} thick and energies up to 100 m.e.v. Results given in the form of curves.

See also: **15637** (isotopic tracers); **15642** (X-ray protective agents); **15651** (energy deposition of neutron in tissue); **15780** (analysis of fission-product waste); **15799** (mass spectrometer analyses of stable isotopes); **15838** (uranium oxide data); **15954** (defects in irradiated LiF); **16083** (analog computers in reactor control); **16266** (food sterilization reactor); **16315** (origin of cosmic rays); **16349** (He gas turbine nuclear plants); **16401** (radiation resistant lubricants); **16456** (irradiation of U-Pu alloys); **16511** (production and separation of U^{235}); **16525** (design and cost of a pyrometallurgical U reprocessing plant); **16580** (thermal cycling stability of uranium); **16748** (nondestructive testing of reactor components); **16983** (radioactive fallout); **17074** (Cr^{51} in welding studies).

OPERATIONS RESEARCH AND MANAGEMENT ENGINEERING

16889 Now Machine-Load Forecasting Can be Dynamic. Robert P. Muller. *American Machinist*, v. 101, Aug. 26, 1957, p. 101-104.

Modern information processing and control techniques.

16890 The Direction of Research Establishments. Papers individually paged. 1957. Her Majesty's Stationery Office, London. (Q183 G79d)

A compilation of 20 papers presented at a Symposium held September 26-28, 1956.

16891* Human Engineering Faults in Test Equipment Design. Robert Bilinski. *Electrical Manufacturing*, v. 60, Aug. 1957, p. 150-152.

A down-to-earth analysis of some commonly overlooked yet serious design defects in electronic test equipment.

16892 Never Overestimate the Power of a Computer. Ralph F. Lewis. *Harvard Business Review*, v. 35, Sept.-Oct. 1957, p. 77-84.

An assay of present and foreseeable future applications of computer systems in business.

16893 New Frontiers for Professional Managers. Ralph J. Cordiner. 121 p. 1956. McGraw-Hill, New York. (HD21 C81n)

An interpretation of managerial philosophy.

16894* Supervisory Problems in Decision Making. Lee E. Danielson and Norman R. F. Maier. *Personnel Psychology*, v. 10, no. 2, Summer 1957, p. 169-180.

A study made of decision making in human relations type of problems.

16895 Training the Supervisor. 126 p. 1956. Available from Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. (HF5549 Un3.26t)

A guide on how to set up and conduct a supervisory training program.

ORE AND MATERIALS BENEFICIATION

16896 Caustic Fusion of Columbite-Tantalite Concentrates With Subsequent Separation of Niobium and Tantalum. J. A. Pierret and H. A. Wilhelm. *Ames Laboratory (U. S. Atomic Energy Commission)*, ISC-796, Aug. 1956, 25 p. (UF767 Un3.1is Contin.)

Procedure involves caustic fusion process followed by separation of Ta and Ni by liquid-liquid extraction.

16897 Oxidation of Iron Oxides. F. Lęcznar. *Henry Brutcher Translation No.* 3948, 12 p. (From *Hutnik (Poland)*, v. 23, no. 11, 1956, p. 413-418.) Henry Brutcher, Altadena, Calif.

The behavior of Fe_3O_4 and Fe_2O_3 as applied to ore and material beneficiation.

16898 A Study of Operating Data From Ball Mills Operating in Quebec, Ontario, Manitoba, and British Columbia. L. E. Djingheuzian. *Canadian Mining and Metallurgical Bulletin*, v. 50, Aug. 1957, p. 504-518; *Canadian Institute of Mining and Metallurgy, Transactions*, v. 60, 1957, p. 290-304.

For the most efficient performance of a ball mill, there must be a definite relationship between critical speed and volume occupied by the ball charge. Data are tabulated.

16899* (German.) The Recovery of Pure Uranium Compounds From Ores. **Die Gewinnung reiner Uran-Verbindungen aus Erzen.** H. Ley. *Chemie-Ingenieur-Technik*, v. 29, July 1957, p. 460-466.

The development of recovery processes.

16900 The Adaptation of New Research Techniques to Mineral Engineering Problems. *Massachusetts Institute of Technology, Department of Metallurgy (U. S. Atomic Energy Commission)*, NYO-7707, Apr. 1957, 36 p. (UF767 U3ny Contin.)

16901* Emulsion Flotation. A. W. Fahrenwald. *Mining Congress Journal*, v. 43, Aug. 1957, p. 72-74.

Increase in rate of recovery to 80 or 90%.

16902 Cyclone Practice in Arizona. Russell Salter and Edwin J. King. *Mining Engineering*, v. 9, Aug. 1957, p. 883-889.

There remain very few classifying operations in which cyclones are not being used, tested, or actively considered.

16903* Electrolytic Copper Production is Goal of Bagdad Pilot Plant Study. *Mining World*, v. 19, Aug. 1957, p. 50-53.

FluoSolids roasting of sulfide concentrates for electrolysis may result in better metal recovery plus commercial-scale output of Cu cathodes.

16904* (Russian.) Study of Conditions of Most Complete Solution of Zinc by Leaching Calcined Concentrates. **Izuchenie uslovii naibolee polnogo perevoda tsinka v rastvor pri vyshchelachivanii obozhzhennykh kontsentratov.** Pak Sen Khe and F. M. Loskutov. *Tsvetnye Metally*, v. 30, no. 7, July 1957, p. 26-31.

Leaching of Zn slag with high concentrations of H_2SO_4 at temperatures between 40 and 80 C for various lengths of time. Preliminary reduction of Zn ferrites in slag. Oxidation and reduction of concentrate by heating followed by leaching.

16905* (Russian.) Theoretical Basis of Precipitation of Cobalt by the Xanthogenate Method. **Teoreticheskie osnovy ksantogenatnogo metoda osazhdeniia kobal'ta iz rastvorov.** I. A. Kakovskii. *Tsvetnye Metally*, v. 30, no. 7, July 1957, p. 42-51.

Curves of quantity of Co precipitation as a function of the amount of xanthogenate used, in pure solutions, or in the presence of Cu, Cd, Ni, or Zn. Possible formation of a trivalent Co xanthogenate.

PHYSICS

16906* (English.) **On the Induced Reverse Response of the Oxidized Aluminium G-M Counter to Visible Light, the Joshi Effect, and the Geiger Counter Sensitivity to the Air-Flux.** B. Sujak. *Acta Physica Polonica*, v. 16, nos. 1-2, 1957, p. 49-62.

The spectral sensitivity of the induced reverse response to visible light is given for the aluminum counter with the momentary photocathode. This light sensitivity does not depend linearly on the intensity of the illumination.

16907* (German.) Theory of Electrical Waves in Nonhomogeneous Plasmas. **Zur Theorie elekrischer Wellen in inhomogenen Plasmen.** Kurt Kischel. *Annalen der Physik*, v. 19, nos. 6-8, 1957, p. 309-321.

16908* (German.) Electron Microscopic Study of Magnetic Powder Patterns. **Elektronenmikroskopische Untersuchung magnetischer Pulvermuster.** Wolfgang Schwartze. *Annalen der Physik*, v. 19, nos. 6-8, 1957, p. 322-328.

Relationship between magnetic structure and the corresponding powder deposit was studied. Deposit depends greatly on external influences such as magnetic moment of the powder particles. The principal resolving power lies at $2 \cdot 10^{-5}$ cm. A method of preparing powder patterns is given.

16909* Influence of Porosity on the *g*-Factor of Ferrites. J. Snieder. *Applied Scientific Research*, v. 6, sec. B, no. 5, 1957, p. 301-311.

A step in the direction of a better understanding of the circumstances influencing the *g*-factor measurements.

16910* The Partial Wave Theory of Electron-Hydrogen Atom Collisions. I. C. Percival and M. J. Seaton. *Cambridge Philosophical Society, Proceedings*, v. 53, July 1957, p. 654-662.

Expressions are given for the calculation of first-order corrections to the results obtained using approximate wave functions.

16911* The Absorption of Very High Frequency Sound in Dielectric Solids. S. Simons. *Cambridge Philosophical Society, Proceedings*, v. 53, July 1957, p. 702-716.

A theoretical treatment is given of the absorption of longitudinally polarized sound in dielectric crystals of high symmetry, due to interaction with the thermal phonons.

16912 Predict Heat Capacities of Gases. Wallace R. Gambill. *Chemical Engineering*, v. 64, Sept. 1957, p. 267-270.

Fundamental vibrational frequencies of bond types help in rapidly estimating heat capacities of gases and vapors.

16913* Measurements of Charge Imparted to Fine Particles by a Corona Discharge. Gaylord W. Penney and Robert D. Lynch. *Communication and Electronics*, 1957, July, p. 294 + 6 pages.

Studies are applied to electrostatic precipitation.

16914* (French.) Electron Structure. **Sur la structure de l'électron.** Georges Jakobi and Nicolas Kolesnikov. *Comptes Rendus*, v. 245, July 17, 1957, p. 286-289.

Equivalence, in the static case, of a non-linear theory of the Born-Infeld type to a linear theory where the electron has one non-punctual charge. The distribution of a one sign charge is impossible.

16915* (French.) Anhysteric Residual Magnetization of Ferrimagnetic Materials. **Sur l'aimantation rémanente anhystérétique des ferrimagnétiques.** Francine Rimbert. *Comptes Rendus*, v. 245, July 22, 1957, p. 406-408.

Acquisition of anhysteric residual magnetization (ARM). Demagnetization of ARM by means of alternating fields. Application of results to the analysis of natural magnetization.

16916* (Russian.) A Study of the Electrostriction of Rochelle Salt Ceramics. **Issledovanie elektrostriktsii segnetokeramiki.** T. N. Verbitskaia. *Doklady Akademii Nauk SSSR*, v. 114, no. 3, May 21, 1957, p. 533-536.

Small additions to barium titanate may result in a reduction of the dependence of dielectric permeability on temperature and field intensity.

16917* **Ordering in Cobalt-Ferrous Ferrites.** H. P. J. Wijn, H. Van Der Heide, and J. F. Fast. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, Suppl., no. 7, 1957, p. 412-417.

Magnetic annealing creates in each crystal a uniaxial anisotropy in a direction which is not necessarily the direction of the applied magnetic field but a crystallographic direction nearest to it. Directional ordering is the most probable origin of this anisotropy.

16918* **Pulse-Response Properties of Rectangular-Loop Ferrites.** H. P. J. Wijn and H. Van Der Heide. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, Suppl., no. 7, 1957, p. 422-427.

16919 Damage to Silicon Produced by Bombardment With Helium Ions. U. F. Gianola. *Journal of Applied Physics*, v. 28, Aug. 1957, p. 868-873.

Some of the effects of bombarding a Si single crystal surface with 3×10^4 e.v. He ions were examined experimentally. These experiments are discussed in terms of radiation damage theory.

16920 The Growth and Decay of Sonic Discontinuities in Ideal Gases. T. Y. Thomas. *Journal of Mathematics and Mechanics*, v. 6, July 1957, p. 455-469.

Equations of motion and continuity. Wave propagation.

16921 Light Scattering by Small Particles. H. C. van de Hulst. 470 p. 1957. John Wiley & Sons, New York. (QC661 H87L)

An explanation of the available data on the scattering of light.

16922 Quarterly Progress Report. *Massachusetts Institute of Technology, Solid-State and Molecular Theory Group. Quarterly Progress Report no.* 25, July 1957, 57 p. (QC1 M38.7q Vis.)

A presentation of 13 articles on molecular theory.

16923* (German.) The Tolerances of Filter Quartzes and Their Measurement. **Über die Toleranzen von Filterquarzen und deren Messung.** C. Kurth and R. Miczynski. *Nachrichtentechnik*, v. 7, June 1957, p. 244-249.

Discussion of theoretical limitations and measurement of the resonance frequencies and inductivities of four quartz samples for use in filters.

16924* (English.) **On the Classical Fluctuation of a Beam of Light.** L. Jánossy. *Nuovo Cimento*, v. 6, ser. 10, July 1957, p. 111-124.

The fluctuation of intensity of a light beam emitted by a macroscopically constant source is evaluated.

16925 Some Properties of Porous Solids Deduced From Apparent Volume Measurements. H. B. Jenkins, Jr. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, K-1342, Aug. 1957, 25 p. (UF767 Un3.1k Contin.)

From analytical expressions the partition function of the atoms which are present in the porous medium is obtained. The partition function of the gas atoms in equilibrium with the porous medium is used to study the potential field, entropy change, and other properties of the atoms in the porous medium.

16926 Stress-Optical Study of Strontium Titanate. A. A. Giardini. *Optical Society of America, Journal*, v. 47, Aug. 1957, p. 726-735.

Strontium titanate has been found to become an optically negative uniaxial crystal when stressed along a crystallographic axis and an optically negative biaxial crystal when under a crystallographic diagonal stress.

16927 (English.) **The Geometry of Grain Boundary Junctions.** S. Amelinckx. *Physica*, v. 23, July 1957, p. 663-692.

Explicit formulas for the densities of dislocations in each set are derived and the results are applied to the NaCl structure. The possibilities of joining three of these nets along a nodal line are investigated and the geometry of these junctions is discussed. Observed examples of boundary junctions are also presented.

16928 Magnetic Field Dependence of the Seebeck Effect in Germanium. M. C. Steele. *Physical Review*, v. 107, ser. 2, July 1, 1957, p. 81-83.

The thermoelectric power (Seebeck effect) of *n*-type Ge single crystals was measured as a function of magnetic field at four temperatures ranging from 78 to 278 K. At all temperatures the magnitude of the thermoelectric power increased with magnetic field.

16929 Antiferromagnetic Resonance in Cr_2O_3. Edward S. Dayhoff. *Physical Review*, v. 107, ser. 2, July 1, 1957, p. 84-91.

The antiferromagnetic resonance spectrum of single-crystal Cr_2O_3 was mapped within the wave length region from 12 mm. to 2.8 mm. and magnetic field intensities from zero to 30,000 oersteds.

16930 Tight-Binding Method for Hexagonal Close-Packed Structure. Maria Miasek. *Physical Review*, v. 107, ser. 2, July 1, 1957, p. 92-95.

Tables for reduction of the matrix components of energy in the tight-binding approximation are given for the hexagonal close-packed lattice.

16931 Surface Conductivity Produced on Zinc Oxide by Zinc and Hydrogen. D. G. Thomas and J. J. Lander. *Physics and Chemistry of Solids*, v. 2, no. 4, 1957, p. 318-326.

The simple space charge theory for adsorbed donor atoms cannot explain all the observations, and it is probable that impurity band conduction is involved.

16932* (French.) Application of the Theory of Diffraction to the Correction of Spherical Aberration. **Application de la théorie de la diffraction a la correction de l'aberration de sphéricité.** Georges Grosset. *Revue d'Optique*, v. 36, June 1957, p. 272-280.

Method consisting in deriving from a given photographic objective, objectives of different focal length by simple similitude, is not compatible with the quest for optimum quality.

16933 Hyperfine Structures of the Resonance Lines of Indium 115. D. A. Jackson. *Royal Society, Proceedings*, v. 241, ser. A, Aug. 20, 1957, p. 283-298.

16934 A Non-Perturbation Method for Non-Linear Field Theories. E. H. Lieb. *Royal Society, Proceedings*, v. 241, ser. A, Aug. 20, 1957, p. 339-363.

The particular problems considered (in first approximation) are the field energy in the presence of an external source, the one- and two-meson propagators, and meson-pair theory.

16935 Cauchy's Problem in Quantum Field Theory. S. Kahana, J. C. Polkinghorne, and J. L. Martin. *Royal Society, Proceedings*, v. 241, ser. A, Aug. 20, 1957, p. 408-413.

It is shown that Cauchy's problem is acceptable for fields satisfying linear equations, and some special results for the accessible case are obtained.

16936 Solid State Physics. Adrianus J. Dekker. 540 p. 1957. Prentice-Hall, Englewood Cliffs, N. J. (QC125 D36s)

An introduction to the physical properties of solids, designed for the physicist, chemist, engineer, or metallurgist.

16937 Thermodynamics. Virgil Moring Faires. 3rd Ed. 543 p. 1957. Macmillan Co., New York. (TJ265 F16t)

A college text covering theory and practical applications.

16938 The Problem of Knudsen Flow. V. Application of the Theory of Radiative Transfer. W. C. DeMarcus. *Union Carbide Nuclear Company (U. S. Atomic Energy Commission)*, K-1302, pt. 5, July 1957, 19 p. (UF767 Un3.1k Contin.)

The scattering is presumed to be a function only of the angle between the incident and scattered directions and there is no provision for correlation between successive processes.

16939 Calorimetric Loss Measurements on Ferromagnetic Cores. E. R. Czerlinsky and R. A. MacMillan. *U. S. Air Force, Cambridge Research Center,* AFCRC-TR-57-107, Mar. 1957, 36 p. (TK7800 Un3.12b Contin.)

Calorimeter and the techniques of operation have been developed for the purpose of evaluating ferromagnetic materials in the form of transformer cores by measuring heat quantities generated as core loss.

16940 An Introduction to the Equations of Magnetogasdynamics. J. A. Steketee. *University of Toronto, Institute of Aerophysics, UTIA Review No.* 9, Apr. 1957, 35 p. (TL570 T64.84r Vis.)

A short discussion of Maxwell's equations is given where some of the classical analogies with familiar relations of hydrodynamics are pointed out. A systematic "derivation" of the equations of magnetohydrodynamics assuming that the equations of Navier Stokes are known.

16941* (English.) **A Correlation Between Theoretical Screw Dislocations and the Known Polytypes of Silicon Carbide.** Richard S. Mitchell. *Zeitschrift für Kristallographie,* v. 109, July 1957, p. 1-28.

The spiral growth of crystals, resulting from screw dislocations, supplies a satisfactory mechanism for generating the structural polytypes of SiC.

See also: **16240** (energy exchange in shock waves); **16250** (hydrodynamic properties of He-II); **16295** (elastic-wave propagation).

PLASTICS

16942 Electron Exchange Polymers. IX. Synthesis of Polymers of 2,5-Dihydroxyphenylalanine and of 3,4-Dihydroxyphenylalanine (DOPA). H. James Harwood and Harold G. Cassidy. *American Chemical Society, Journal,* v. 79, Aug. 20, 1957, p. 4360-4365.

Preparation of the appropriate monomers in which the phenolic hydroxyls of the dihydroxyphenylalanines are protected by acetyl groups. These syntheses now make available new electron exchange polymers that are also polypeptides.

16943 Polymerisation of Benzyl and Some Substituted Benzyl Perchlorates. P. F. G. Praill. *Chemical Society, Journal,* 1957, July, p. 3162-3164.

Solutions of benzyl perchlorate in nitromethane deposit polymer of relatively low mol. wt. If an aromatic hydrocarbon is present in the mixture the diarylmethane is formed.

16944 Properties and Performance of Reinforced Polyester Plastics in the Chemical Industry. R. E. Gackenbach and Donald G. Estey. *Corrosion,* v. 13, Aug. 1957, p. 546t-552t.

Basic properties to be considered by designers and fabricators. Use for alum evaporators, stacks, dryer trays, filter troughs, and filter press plates and frames.

16945* (Russian.) Kinetics of Mechanical Destruction of Polymers. **Kinetika mekhanicheskoi destruktsii vysokopolimerov.** N. K. Baramboim. *Doklady Akademii Nauk SSSR,* v. 114, no. 3, May 21, 1957, p. 568-570.

Free macroradicals initiated by mechanical destruction of a polymer are exposed to transformation under action of various media. Equations for determination of limit of destruction. Comparison between experimental and calculated data.

16946 Now *You* Can Weld Plastics. *Factory Management and Maintenance,* v. 115, Aug. 1957, p. 134-136.

Hot gas welding, the surest, fastest method for joining plastic materials.

16947* (German.) Some New Applications of Epoxide Resins. **Einige neue Anwendungsmöglichkeiten von Epoxyharzen.** J. J. Zonsveld. *Fette, Seifen, Anstrichmittel,* v. 59, July 1957, p. 525-529.

Discussion of amine curing systems of improved water resistance by suitable choice of mixtures of various amine adducts. A further new development is the production of esters from low-molecular epoxide resins for application as printing inks, for which solvent-free binders with a wide viscosity range can be recommended.

16948 Recent Developments in the Chemistry of the Urea-Formaldehyde Resins. R. H. Glauert. *Industrial Chemist,* v. 33, Aug. 1957, p. 392-398.

New theoretical interpretations of the resin-forming reaction.

16949 *m*-Xylylenediamine Polyamide Resins. E. F. Carlston and F. G. Lum. *Industrial and Engineering Chemistry,* v. 49, Aug. 1957, p. 1239-1240.

A new diamine shows promise for producing superpolyamides for use in fibers, films, and molding materials. Polymer crystals have m.p. of 243 C and heat distortion temperature of over 200 C.

16950 Fluorine-Containing Polyethers. D. D. Smith, R. M. Murch, and O. R. Pierce. *Industrial and Engineering Chemistry,* v. 49, Aug. 1957, p. 1241-1246.

3, 3, 3-Trifluoro-1,2-epoxypropane and 2-methyl-3,3,3-trifluoro-1,2-epoxypropane were prepared and polymerized reproducibly to polyethers with ferric chloride catalyst. These polyethers possessed good solvent resistance to most common organic solvents, but could not be vulcanized to rubberlike materials.

16951 Relation of Intrinsic Viscosity to Cellulose Chain Length. Degree of Polymerization Range Below 400. W. J. Alexander, Otto Goldschmid, and R. L. Mitchell. *Industrial and Engineering Chemistry,* v. 49, Aug. 1957, p. 1303-1306.

16952 The Mechanical and Electrical Properties of Polymers: An Elementary Molecular Approach. John D. Hoffman. *Institute of Radio Engineers, Transactions on Component Parts,* v. CP-4, June 1957, p. 42-69. (TK1 In6.6cp Contin.)

Linear polymers derived from ethylene, and chemically substituted ethylene are used to illustrate basic concepts.

16953* **Isocyanate Based (Urethane) Insulations. II. Products and Applications.** *Insulation,* v. 3, Aug. 1957, p. 39-43.

Discusses wire enamels, coatings for fabrics and sleevings, and impregnating varnishes. (To be concluded.)

16954 On Creep and Relaxation. I. L. Hopkins and R. W. Hamming. *Journal of Applied Physics,* v. 28, Aug. 1957, p. 906-909.

The creep function for the "National Bureau of Standards" polyisobutylene at 25 C is calculated from the relaxation function, using the integral equation connecting them. The calculated function is shown to be correct in its initial slope, to satisfy the inequality $\phi(t)\,\Psi(t) < 1$ throughout and to approach satisfactorily the independently determined asymptote.

16955 Dynamic Mechanical Properties of Poly-*n*-Hexyl Methacrylate. William C. Child, Jr. and John D. Ferry. *Journal of Colloid Science,* v. 12, Aug. 1957, p. 389-399.

16956 Viscosities of Concentrated Polymer Solutions. IV. Cellulose Tributyrate. Robert F. Landel, John W. Berge, and John D. Ferry. *Journal of Colloid Science,* v. 12, Aug. 1957, p. 400-411.

16957* Copolymerization of Butyl Acrylate and Vinylpyridine. B. L. Funt and E. A. Ogryzlo. *Journal of Polymer Science,* v. 25, Aug. 1957, p. 279-284.

Spectrophotometric analysis was employed for determining copolymer compositions utilizing the vinylpyridine absorption at 263 mμ.

16958* Ultrasonic Degradation of Cellulose Nitrate. II. Effects of Temperature, Solvent, and Other Process Variables. Berwyn B. Thomas and W. J. Alexander. *Journal of Polymer Science,* v. 25, Aug. 1957, p. 285-303.

16959* Methyl Ethyl Ketone Peroxide as an Initiator in the Polymerization of Vinyl Monomers. M. R. Gopalan and M. Santhappa. *Journal of Polymer Science,* v. 25, Aug. 1957, p. 333-349.

The initiator MEKP is comparable to Bz_2A_2 and azobisisobutyronitrile in its catalyst efficiency, while its capacity for chain transfer is found to be intermediate between the nontransferring initiators like azobisisobutyronitrile and the highly transferring initiators such as cumene hydroperoxide.

16960* (Russian.) The Heats of Swelling and of Solution of Polymers in Relation to Molecular Weights and Temperatures. **Teploty nabukhaniia i rastvoreniia polimerov v zavisimosti ot molekuliarnogo vesa i temperatury.** K. S. Akhmedov and S. M. Lipatov. *Kolloidnyi Zhurnal*, v. 19, May-June 1957, p. 257-260.

Studies on PVC and Orlon show various relationships between the heat effects and the mol. wt. and temperatures for different temperature intervals; these relationships are not connected with the packing density.

16961* (Russian.) The Adhesion of High Polymers. **Adgeziia vysokopolimerov. III.** The Effect of the Size, Shape, and Polarity of High Polymer Molecules on Their Adhesion to Cellophane. **Vliianie na adgeziiu k tsellofanu velichiny, formy i poliarnosti molekul vysokopolimera.** S. S. Voiutskii, A. I. Shapovalova, and A. P. Pisarenko. *Kolloidnyi Zhurnal*, v. 19, May-June 1957, p. 274-280.

16962* (Russian.) A Study of the Structural and Mechanical Properties of Ethylcellulose Solutions and the Effect on These Properties of Ethylcellulose Oxidation. **Issledovanie strukturno-mekhanicheskikh svoistv rastvorov etiltselliulozy i vliianie ee okisleniia na eti svoistva.** T. I. Samsonova and L. V. Ivanova-Chumakova. *Kolloidnyi Zhurnal*, v. 19, May-June 1957, p. 343-351.

16963* (German.) Variations of the Dielectric Relaxation Spectra of High Polymers by Distortion. **Veränderungen des dielektrischen Relaxationsspektrums von Hochpolymeren durch Verstreckung.** K. Huff and F. H. Müller. *Kolloid-Zeitschrift*, v. 153, July 1957, p. 5-28.

An a.c. bridge was used in the frequency range from 178 c.p.s. to 316 kc. at temperatures between −140 and +170 C in order to measure the loss angle of high polymers, such as polyvinyl chloride, polyvinyl alcohol, and polystyrene.

16964* (English.) **Polyacrylamidoximes.** F. L. M. Schouteden. *Makromolekulare Chemie*, v. 24, no. 1, 1957, p. 25-49.

The production of new polymeric products. Reactions and analysis.

16965 Jet Age Crash Helmet. J. R. Fisher and Michael Theodore. *Modern Plastics*, v. 34, Aug. 1957, p. 88-91.

Describes assembling of 12 major plastic components involved in new concept of head protection.

16966 Spiral-Flow Molding. L. Griffiths. *Modern Plastics*, v. 34, Aug. 1957, p. 111-115.

Method of comparing the flow behavior of thermoplastic materials under actual injection molding conditions.

16967 Epoxy Parabolic Mirrors. Paul B. Archibald. *Modern Plastics*, v. 34, Aug. 1957, p. 116-117.

Epoxy resin is cured while spinning, then plated, to produce inexpensive, high-grade mirrors. Astronomical quality mirrors depend on further refinements.

16968 Low-Toxicity Aliphatic Amines for Cross-Linking Polyepoxy Resins. C. F. Pitt and M. N. Paul. *Modern Plastics*, v. 34, Aug. 1957, p. 125 + 3 pages.

Twelve N-hydroxyalkyl-polyamines were evaluated as cross-linking agents for polyepoxy resins. The availability of these cross-linking agents with lower skin toxicity offers a means for overcoming one of the major deterrents in the widespread utilization of epoxy resins.

16969 A Method for Testing Quality of Phonograph Records. M. J. Gifford, P. C. Woodland, and R. B. Dahl. *Modern Plastics*, v. 34, Aug. 1957, p. 140 + 3 pages.

Visual, aural, and electronic means are discussed.

16970 Plastic Piping—8 Years Later. W. D. Greathouse and R. L. McGlasson. *Oil and Gas Journal*, v. 55, Aug. 12, 1957, p. 106-112.

Studies three types of currently available materials: extruded plastics, glass-reinforced plastics, and plastic coatings. Preferred use for each type is shown based on maintenance cost, property deterioration in service, and temperature-strength and creep characteristics.

16971* (German.) Dielectric Properties of Macromolecules and Their Mixtures as a Function of Temperature, and Comparison With Mechanical Measurements. **Dielektrische Eigenschaften Hochmolekularer und deren Mischungen in Abhängigkeit von der Temperatur und ein Vergleich zu mechanischen Messungen.** H. Wolff. *Plaste und Kautschuk*, v. 4, July 1957, p. 244-246.

Mixtures of Buna S4 with PVC and Vinalite SP60 with Vinalite MPS were tested in rollers for vibration absorption and for variation of the loss factor as a function of temperature.

16972* (German.) Polypropylene, a New Plastic Material. **Polypropylen, ein neuer Plastwerkstoff.** *Plaste und Kautschuk*, v. 4, July 1957, p. 262-265.

Stereospecific polymerization and stereo-isomers of polypropylene. Thermal, electrical, and chemical properties of polypropylene PR/56. Extrusion; gas attack; injection molding; compression molding; applications.

16973 Epoxy Plasticizers for P.V.C. T. C. Moorshead. *Plastics*, v. 22, Aug. 1957, p. 343-345.

The properties of epoxy plasticizers derived from vegetable oils are described and compared with other types.

16974 Molding-Finish Interactions in Fatigue of Glass-Reinforced Polyester Resins. R. C. Hooper. *Plastics Technology*, v. 3, Aug. 1957, p. 644-649.

Investigation of the effect of various finishes and cure cycle speeds on laminate properties.

16975 The Viscous Behaviour of Dilute Solutions of a Strong Polyelectrolyte (Polystyrene Sulphonate). J. A. V. Butler, A. B. Robins, and K. V. Shooter. *Royal Society, Proceedings*, v. 241, ser. A, Aug. 20, 1957, p. 299-310.

It was found that at the maximum of the viscosity curve, the extension of the particle in water is about half of the total contour length and is sufficient to permit of particle interaction at these concentrations. The length is greatly diminished by increase of the ionic strength, and even if interaction occurs at low concentrations, it ceases to be the dominant factor when the concentration is greater than 0.003% in most cases.

16976 Studies in Polymerization. XII. Salt Effects on the Polymerization of Acrylonitrile in Non-Aqueous Solution. C. H. Bamford, A. D. Jenkins, and R. Johnston. *Royal Society, Proceedings*, v. 241, ser. A, Aug. 20, 1957, p. 364-375.

Complex formation with anions is found to decrease in the order $Cl^- > NO^-_3 > ClO^-_4$. The termination reaction is not significantly affected by the presence of salts. In certain circumstances an anionic polymerization of acrylonitrile, initiated by the salt was observed.

16977 Effects of Foaming Catalysts on Hydrolysis-Aging of Urethane Foams. Joseph Winkler. *Rubber Age*, v. 81, Aug. 1957, p. 799-803.

An analysis of the role of the activator in the aging velocity of resilient foams, and a report on research for a new activator.

16978* Silicon Polymers as High-Temperature Insulation for Miniature Power Transformers. F. T. Parr. *SPE Journal*, v. 13, Aug. 1957, p. 19-22.

Organosilicon materials are the answer to special high temperature electrical insulation requirements.

16979* Flow Behavior and Turbulence in Polyethylene. R. F. Westover and Bryce Maxwell. *SPE Journal*, v. 13, Aug. 1957, p. 27-36.

The effects of temperature, pressure, and tube diameter upon the rate of flow of the polyethylene were studied along with their relationship to the effective viscosity of the extruded material. The relationship of the rate of flow to the final diameter of the cooled polyethylene cylinder was studied for all the temperatures and tube sizes used. An effort was made to obtain a better understanding of the phenomenon of turbulence in plastic materials.

16980* Reinforced Laminates for High Temperature Use. S. G. Salzinger. *SPE Journal*, v. 13, Aug. 1957, p. 42-46.

Plastics suitable for high temperature use include phenolics, silicones and epoxies. Best results are due to judicious selection of resin and filler; special attention to curing methods.

16981* Studies in the Gas and Vapor Permeability of Plastic Films and Coated Papers. IV. Effect of a Paper Substrate. R. Bhargava, C. E. Rogers, V. Stannett, and M. Szwarc. *Tappi*, v. 40, July 1957, p. 564-567.

The effect of the paper substrate was investigated by using coatings of several thicknesses.

See also: **15731** (vinyl acetate from petroleum); **15962** (ethyl methacrylate and its polymer); **16032** (curing glass-fiber laminates); **16487** (plastic cable insulation); **16542** (plastics in foundry patterns); **17048** (polyisobutylene film).

POLLUTION AND WASTES

16982 Scrap Refinery Controls Smoke With Water Scrubber. L. Bykowski. *Iron Age*, v. 180, Aug. 15, 1957, p. 96-97.

A type A hydro precipitator scrubber, designed to remove low and submicron solids from exhaust gases at high and dependable efficiencies is described.

16983* Radioactive Fallout. Willard F. Libby. *National Academy of Sciences of the United States of America, Proceedings*, v. 43, Aug. 1957, p. 758-775.

There are in general three different kinds of radioactive fallout, the relative importance of which is determined by the nature of the weapon, principally its yield, and the conditions of firing.

16984 Utilization of Telemetering Techniques in Evaluating Residual Radioactive Contamination. Richard W. Johnston. *Operation Teapot (U. S. Atomic Energy Commission)*, WT-1182, July 1957, 24 p. (UF767 Un3.1wt Contin.)

A gamma-radiation telemetering system is described which was utilized to measure fallout levels at the Nevada Test Site from the vicinity of Ground Zero out to, and including, an area bounded by Reno, Nev.; Salt Lake City, Utah; Kingman, Ariz.; and Baker, Calif. Data on all fall-out measurements are presented, and recommendations for improvements of the system are made.

16985 Cyanide Waste—Oxidized in the Plating Room. E. A. Hill and F. J. Neff. *Plating*, v. 44, Aug. 1957, p. 864-868.

Case history of an internal plant designed to oxidize cyanides by alkaline chlorination.

16986 Operating Experiences With Chromic Acid Recovery Equipment. Clifford L. Gough and Charles G. Bueltman. *Plating*, v. 44, Aug. 1957, p. 879-883.

Some helpful observations for those using ion-exchange units for recovery of chromic acid from rinse waters and primary solutions.

16987* Contact Aeration Sewage Treatment Plants in New Jersey. John Wilford and Thomas P. Conlon. *Sewage and Industrial Wastes*, v. 29, Aug. 1957, p. 845-855.

Evaluation of the contact aeration treatment method; collection of data for the drafting of rules and regulations to control the design of contact aeration sewage treatment plants.

16988* Textile Wastes—Recovery and Treatment. R. H. Souther and T. A. Alspaugh. *Sewage and Industrial Wastes*, v. 29, Aug. 1957, p. 918-935.

Discusses some of the ways and means used to reduce the liquid waste load from textile mills including closer control of wet processes, process modification, and recovery of usable products for re-use.

16989* Immediate Oxygen Demand Removal From Digester Supernatant Liquor. H. O. Halvorson. *Water & Sewage Works*, v. 104, Aug. 1957, p. 374-376.

Experiments show how to remove the crippling immediate O demand from sludge digester decant liquors.

See also: **15613** (effects of radiation fall-out on plants); **15738** (determination of atmospheric Hg); **15807** (oxygen analyzer for water); **16278** (phenol in coking wastes); **16785** (sea disposal operations).

RUBBER AND ELASTOMERS

16990* (German.) Hot and Cold Cured Silicone Rubber Types and Their Industrial Applications. **Heiss- und kaltvulkanisierende Silikonkautschuktypen und ihre Verwendung in der Technik.** M. Wick. *Elektrotechnik und Maschinenbau*, v. 74, Aug. 1, 1957, p. 355-363.

Types of silicone rubbers and their heat resistance, flexibility at low temperatures, mechanical strength, plasticity, resistance to chemical action, and electrical properties. Uses in molds, medical articles, and coatings.

16991 Simultaneous Stripping of Styrene and Methanol From Synthetic Rubber Latex. H. C. Van Ness, O. E. Dwyer, and W. W. Slobbe. *Industrial and Engineering Chemistry*, v. 49, Aug. 1957, p. 1271-1276.

Batch still data are useful in predicting changes in capacity of continuous plant scale equipment for making cold rubber.

16992 Carbon Black in the Oxidation of Butadiene-Styrene Vulcanizates. J. Reid Shelton and William T. Wickham, Jr. *Industrial and Engineering Chemistry*, v. 49, Aug. 1957, p. 1277-1282.

Carbon black added to GR-S vulcanizates may function in many ways to alter the rate of oxidation.

16993 Influence of Petroleum Oils on Staining and Discoloration of Elastomeric Compounds. Henry M. Tramutt, Ervin G. Anderson, Fritz S. Rostler, and Richard M. White. *Industrial and Engineering Chemistry*, v. 49, Aug. 1957, p. 1283-1292.

16994 Oil-Masterbatched Butadiene-Styrene Polymers. Influence of Various Antioxidants on Polymer Breakdown. W. K. Taft, June Duke, and Dorothy Prem. *Industrial and Engineering Chemistry*, v. 49, Aug. 1957, p. 1293-1296.

Antioxidants β-conidendrol and 2246 were superior antioxidants from the point of view of ultimate polymer stability. The former is suggested as being worthy of more extended study for overcoming the storage instability of oil-polymer masterbatches, and the latter for preventing gelation with less reactive oils or for slowing the rate of breakdown with the reactive oils.

16995* Mechanical Properties of Natural and Synthetic Rubbers. F. Bueche. *Journal of Polymer Science*, v. 25, Aug. 1957, p. 305-324.

The tensile creep behavior of natural rubber, high and low temperature GRS, polybutadiene, and a synthetic *cis*-polyisoprene were investigated. A theoretical relation for the heat production in flexed rubbers is given.

16996* Chain Scission Efficiency in the Oxidation of Natural Rubber Vulcanizates. A. G. Veith. *Journal of Polymer Science*, v. 25, Aug. 1957, p. 355-372.

Concurrent measurements of the chain scission velocity and oxidation rate are studied.

16997* (Russian.) Vulcanization of Ebonites. **Vulkanizatsiia Ebonitov.** A. S. Kuz'minskii and L. V. Borkova. *Kauchuk i Rezina*, v. 16, Jan. 1957, p. 14-22.

The best-vulcanized ebonite is an unsaturated compound. The velocity of double-bond consumption and the limit of unsaturation have no relation to the amount of S. Development and disintegration of S cross links occur during vulcanization.

16998* (Russian.) Basic Trends in the Technical Development of the Synthetic Rubber Industry. **Osnovnye napravleniia tekhnicheskogo razvitiia otechestvennoi promyshlennosti sinteticheskogo kauchuka.** A. K. Nikitin. *Kauchuk i Rezina*, v. 16, Feb. 1957, p. 1-5.

Synthesis of various heat-resistant high-polymeric compounds. High wear resistance can be obtained with the aid of rubber-like materials such as polyetherurethane polymers and sulfochlorinated polyethylene.

16999* (Russian.) Properties of Synthetic Silicone Rubbers. **Svoistva silikatnykh sinteticheskikh kauchukov.** A. P. Pisarenko, A. P. Emel'ianova, and P. I. Zakharchenko. *Kauchuk i Rezina*, v. 16, Feb. 1957, p. 6-13.

17000* (Russian.) Carboxyl-Containing Rubbers. **Karboksilsoderzhashchie kauchuki. I.** Synthesis of Carboxyl-Containing Rubbers and the Study of the Structure of Polymers and Rubbers. **Sintez karboksilsoderzhashchikh kauchukov i izuchenie struktury polimerov i rezin.** B. A. Dolgoplosk, E. I. Tiniakova, V. N. Reikh, T. G. Zhuravleva, and G. P. Belonovskaia. *Kauchuk i Rezina*, v. 16, Mar. 1957, p. 11-14.

Study of composition in relation to degree of polymerization. Properties and structural characteristics of rubbers. Durability in relation to structure of vulcanized networks.

17001* (Russian.) Use of Radioactive Isotopes in Rubber Industry. **Primenenie radioaktivnykh izotopov v rezinovoi promyshlennosti.** M. Ia. Kaplunov and Z. N. Tarasova. *Kauchuk i Rezina*, v. 16, Mar. 1957, p. 15-18.

Radioactive isotopes are used mainly for checking the thickness of rubber and rubber-fabric materials, studying the wear of tires and distribution of various materials in rubber, studying solubility and migration of ingredients in rubber, removing electrostatic charge, determining viscosity and gas permeability, and analysis.

17002* (Russian.) High Frequency Heating in the Rubber Industry. **O primenenii elektronagreva tokami vysokoi chastoty v tekhnologii rezinovogo proizvodstva.** Kh. E. Malkina and A. P. Pukhov. *Kauchuk i Rezina*, v. 16, no. 4, Apr. 1957, p. 23-28.

Electrical properties of rubber mixtures and the vulcanization by means of high frequency heating. Role of carbon black.

17003* (Russian.) Tires From Synthetic Polyisoprene Rubber. **Shiny iz sinteticheskogo poliizoprenovogo kauchuka (SKI).** G. N. Buiko, A. G. Shvarts, and A. I. Tumanova. *Kauchuk i Rezina*, v. 16, no. 5, May 1957, p. 1-11.

Properties of tires made of (SKI) rubber are compared with the natural rubber product.

17004* (Russian.) Carboxyl Containing Rubbers. **Karboksilsoderzhashchie kauchuki. II.** Basic Properties of Carboxyl Containing Rubbers. **Osnovnye svoistva rezin na osnove karboksilsoderzhashchikh kauchukov.** B. A. Dolgoplosk, et al. *Kauchuk i Rezina*, v. 16, no. 6, June 1957, p. 1-6.

Mechanical and elastic properties are compared with those of ordinary synthetic rubbers.

17005* (Russian.) Effect of Ionization Radiation of Vulcanized and Raw Rubber. **O deistvii ioniziruiushchikh izluchenii na kauchuki i reziny.** A. S. Kuz'minskii, T. S. Nikitina, and B. L. Tsetlin. *Kauchuk i Rezina*, v. 16, no. 6, June 1957, p. 12-18.

Review of literature concerning effects of radiation on organic compounds, transformation of polymers, and vulcanization processes. Properties of rubbers exposed to radiation.

17006* (German.) A New Method for Determining Optimal Vulcanization of Rubber Mixtures. **Eine neue Methode zur Bestimmung der optimalen Vulkanisation von Kautschuk-Mischungen.** J. Peter and W. Heidemann. *Kautschuk und Gummi*, v. 10, July 1957, p. 168WT-172WT.

Advantages: ascertaining vulcanization curve without graduated heating; small amounts of material; quick processing; good reproducibility; automatic operation. Disadvantages: necessity for trained personnel; high initial costs.

17007* (Russian.) Industrial Methods for Synthesizing Isoprene. **Promyshlennye metody sinteza izoprena.** I. L. Fridshtein and O. B. Litvin. *Khimicheskaia Nauka i Promyshlennost*, v. 2, no. 3, 1957, p. 299-305.

The formation of *cis*-polyisoprene rubber with the addition of isoprene molecules in the 1,4 positions takes place under the influence of several metal-organic compounds. The best results were obtained in the presence of metallic Li derivatives.

17008* (Russian.) Production of α-Methyl Styrene and Divinylmethyl Styrene Rubber. **Proizvodstvo α-metilstirola i divinilmetilstirol'nogo kauchuka.** M. S. Nemtsov, I. I. Radchenko, and S. L. Fisher. *Khimicheskaia Nauka i Promyshlennost*, v. 2, no. 3, 1957, p. 306-322.

17009* (Russian.) Synthesis of Special Purpose Rubbers. **Puti sinteza kauchukov spetsial'nogo naznacheniia.** N. P. Apukhtina. *Khimicheskaia Nauka i Promyshlennost*, v. 2, no. 3, 1957, p. 323-330.

Includes data on the properties of various rubbers.

17010* (Russian.) The Synthesis of Polysiloxane Rubber and the Study of Its Properties. **Sintez polisiloksanovogo kauchuka i izuchenie ego svoistv.** I. K. Stavitskii. *Khimicheskaia Nauka i Promyshlennost*, v. 2, no. 3, 1957, p. 331-338.

17011* (Russian.) Concerning the Evaluation of Rubber and Solvent Interaction. **K voprosu otsenki vzaimodeistviia kanchukov s rastvoriteliami.** A. G. Shvarts. *Kolloidnyi Zhurnal*, v. 19, May-June 1957, p. 376-383.

The effect of the diverse intermolecular forces of different solvents on their dissolution capacities with respect to natural, sodium butadiene, divinylstyrene, divinylnitrile-acryl and polychloroprene rubbers was examined. A graphical method is proposed for evaluating the effect of the character of the intermolecular forces of the solvent on the maximum swelling of the vulcanizates.

17012 How to Protect Metals With Elastomeric Linings. L. A. Woerner. *Materials in Design Engineering*, v. 46, Aug. 1957, p. 94-98.

Linings of natural or synthetic rubber and some plastics withstand corrosive chemicals and have long life under abrasive conditions.

17013* (Polish.) Mechanism and Causes of Elastic and Plastic Phenomena in Rubber Stretching. **Mechanizm i przyzyny zjawisk elastyczności i plastyczności przy rozciąganiu gumy.** T. Porayski. *Przemysł Chemiczny*, v. 13, May 1957, p. 256-258.

17014 A Graphical Technique for Determining the Thickness of Cast Latex Films. James T. Hill, Guy A. Hanks, and John W. Hodge, Jr. *Rubber Age*, v. 81, Aug. 1957, p. 804-806.

Method of film thickness determination may be used regardless of shape or size of the porous mold, but a new calibration curve must be determined for each different type and size.

17015 The Use of Polyglycol HS.35/40 in the Manufacture of Latex Foam. E. G. Pole and E. G. Cockbain. *Rubber Developments*, v. 10, Summer 1957, p. 48-51.

Typical formulations are not critical and no allowance is made for variations in room or latex temperatures. These foams are stable at room temperature and the danger of premature gelation is eliminated.

17016* Non-Free Sulfur Curing Systems for Age Resistant Styrene-Butadiene Rubber. L. M. Hobbs, R. G. Craig, and C. W. Burkhart. *Rubber World*, v. 136, Aug. 1957, p. 675 + 12 pages.

Resistance to air-oven aging of rubber vulcanizates cured with accelerators, with dicumyl peroxide and phenyl-β-naphthylamine, and with combinations thereof, showed that vulcanizates from all of these non-free sulfur curing systems had greater resistance to aging than did vulcanizates from the conventional free sulfur-accelerator combination.

17017* A Versatile New Family of Elastomers. II. G. E. Meyer, et al. *Rubber World*, v. 136, Aug. 1957, p. 695-701.

Low temperature stiffening and embrittlement of adduct elastomers was examined as a function of the extent of saturation, chain length of mercaptan, and composition of base polymer; swelling properties of the base polymer were examined.

17018* (Russian.) Oxidation Decomposition of Sodium-Divinyl Rubber Ozonide. **Okislitel'noe razlozhenie ozonida natriidivinilovogo kauchuka.** A. I. Iakulchik, N. G. Kacatkina, G. I. Demidova, and G. B. Fedorova. *Zhurnal Obshchei Khimii*, v. 27, May 1957, p. 1195-1201.

17019* (Russian.) The Effect of Metal Oxides as Activators in the Vulcanization of Sodium-Butadiene Rubber. **Deistvie okislov metallov v kachestve aktivatorov vulkanizatsii natrii-**

butadienovogo kauchuka. M. Fel'dshtein, P. Orlovskii, and B. Dogadkin. *Zhurnal Prikladnoi Khimii*, v. 30, no. 6, June 1957, p. 917-926.

Sodium-butadiene rubber which contains accelerators of the thiazole and sulfonamide type does not need metal oxides for activating the vulcanization process.

See also: **16111** (silicone insulation); **16442** (how to apply O-rings).

SPACE HEATING AND CONDITIONING

17020* Sizing Coils for Near-Freezing Air. Melvin A. Ramsey. *Air Conditioning, Heating, and Ventilating*, v. 54, Aug. 1957, p. 75-78.

A rapid, accurate method, design data, and typical problem are treated in detail.

17021* Solar Collector is Source and Sink for Japanese Heat Pump System. *Air Conditioning, Heating, and Ventilating*, v. 54, Aug. 1957, p. 97-99.

Year around air conditioning for a private residence.

17022* Steam-Jet Refrigeration Systems. Carl C. Clayton. *Cost Engineering*, v. 2, Apr. 1957, p. 42-48.

An economic means of furnishing large quantities of refrigeration at temperatures above 35 F.

17023* Refrigerant Piping for Remote Condensing Units. Allen Trask. *Heating & Air Conditioning Contractor*, v. 48, Aug. 1957, p. 52-55.

Covers the piping techniques which should be used to assure a moisture-free, leak-proof refrigerant circuit.

17024 How to Design and Maintain Compressed Air Piping Systems. R. J. Nemmers. *Heating, Piping & Air Conditioning*, v. 29, Aug. 1957, p. 92-95.

17025 How to Use Digital Computers to Calculate Piping Flexibility. Tor Kolflat and K. E. Knapp. *Heating, Piping & Air Conditioning*, v. 29, Aug. 1957, p. 106-108.

Flexibility calculations for main steam and reheat steam piping systems in central station applications.

17026 Pressure Losses and Flow Characteristics of Multiple-Leaf Dampers. Edward J. Brown and Julian R. Fellows. *Heating, Piping & Air Conditioning*, v. 29, Aug. 1957, p. 119-125.

Typical flow characteristics for a number of damper and system combinations are included.

17027 Control of High-Velocity Double-Duct Systems. H. W. Alyea. *Heating, Piping & Air Conditioning*, v. 29, Aug. 1957, p. 130-134.

Instrumentation of air conditioning systems.

17028* Heat and Vapor Movement on Refrigerated Packaged Goods. E. K. Heaton, C. F. Kayan, and J. G. Woodroof. *Refrigerating Engineering*, v. 65, Aug. 1957, p. 42 + 11 pages.

Description of experiments on condensation of moisture and its resulting ill effects.

17029* Rates of Thermal Decomposition of $CHClF_2$ and CF_2Cl_2. Francis J. Norton. *Refrigerating Engineering*, v. 65, Sept. 1957, p. 33 + 3 pages.

Thermal decomposition rates were measured from 175 to 570 C. These rates are greatly increased in the presence of Fe and Cu oxides. The progress of decomposition was followed continuously by a mass spectrometer and the products determined.

17030* Capillary Two-Phase Flow. II. H. A. Whitesel. *Refrigerating Engineering*, v. 65, Sept. 1957, p. 35-40.

Tables and charts are given to facilitate calculation of friction factors and critical discharge pressures of Refrigerant 22.

17031 Solar Radiation in Air Conditioning. Ivor S. Groundwater. 125 p. 1957. Crosby Lockwood & Son, Ltd., London. (TH7687 G91s)

A treatise on solar radiation for the consulting engineer, architect, and air-conditioning engineer.

17032 (Czech.) Steam Jet Refrigerating Installations. **Paroproudová chladici zařizení.** J. Šenberk. *Strojírenství*, v. 7, July 1957, p. 488-490.

Installations are useful at certain temperatures, where machine systems of refrigerating by means of compressors or absorption are not economical. A theoretical explanation of the circulation, and computation of the steam consumption of a steam jet compressor is given along with details of plant construction.

17033 The Design of a Heat Pump Buried Coil. Donald M. Vestal, Jr. and Billie J. Fluker. *Texas Engineering Experiment Station, Bulletin* 139, Aug. 1957, 29 p. (TA21 T31.2b Vis.)

See also: **15593** (grain drying by heat pump).

TEXTILES, FIBERS, LEATHER, AND PAPER

17034 Lignin Structure. XI. A Quantitative Study of the Alcoholysis of Lignin. Kyosti Sarkanen and Conrad Schuerch. *American Chemical Society, Journal*, v. 79, Aug. 5, 1957, p. 4203-4209.

Deals with the re-ethanolysis of ether-insoluble ethanol lignins, isolated under mild conditions from spruce wood.

17035* Characterization of Cellulose Derivatives by Means of the X-Ray Diffractometer. Leon Segal and C. M. Conrad. *American Dyestuff Reporter*, v. 46, Aug. 26, 1957, p. 637-642.

Application of the diffractometer to such operations as measurement of crystallite orientation, qualitative detection of the transformation of cellulose from one crystal type to another, measurement of the extent of crystal transformation of chemical cellulose complexes, and determination of changes in degree of crystallinity of the cellulose in the fiber.

17036* A Laboratory Method for Measuring Effects of Process Variables on Leather Quality. I. Selection of Samples for Laboratory Experiments. II. Laboratory-Scale Experiments and Assessment of Leather Quality. Herbert J. Hodus and Robert Stubbings. *American Leather Chemists Association, Journal*, v. 52, Aug. 1957, p. 414-449.

17037 Nonwoven Filter Media. Arthur C. Wrotnowski. *Chemical Engineering Progress*, v. 53, July 1957, p. 313-319.

The filtration characteristics of mechanically interlocked fibers, wool felts, and bonded fabrics were discussed with special emphasis on their suitability for chemical processing.

17038* Effect of Several Drying Conditions on Strength of Coast-Type Douglas-Fir Timbers. R. D. Graham. *Forest Products Journal*, v. 7, July 1957, p. 228-233.

Four-inch timbers were air-dried, kiln-dried, and organic-vapor-dried; study made of the effect of various temperatures on drying rate, hygroscopicity, checking, and strength.

17039* How Wood Shrinks and Swells. Edward C. Peck. *Forest Products Journal*, v. 7, July 1957, p. 235-244.

Mechanics of shrinking and swelling and the influence of wood structure during seasoning and in use; methods of minimizing effects.

17040* Dimensional Stabilization of Wood: II. Crotonylation and Crotylation. J. Risi and Donald F. Arseneau. *Forest Products Journal*, v. 7, July 1957, p. 245-246.

Crotonylated samples had ester contents from 13.9 to 20.9%, and had antishrink efficiencies from 49.7 to 73.4%. Crotylated samples exhibited a high degree of dimensional stability but were badly degraded.

17041* (Hungarian.) Lignin Peptization. **A lignin peptizációjáról.** Aladár Buzágh and Ildikó Tar. *Magyar Kémiai Folyóirat*, v. 63, Apr.-May 1957, p. 132-143.

A study of alkaline peptization of different lignins by means of NaOH. Rye straw, pine saw-dust, and peat were used with dioxane. Peptization curves.

17042* Fabrics in Industry. Edward A. McMaster. *Modern Textiles Magazine*, v. 38, Aug. 1957, p. 59-62.

A review of specialized uses.

17043* (Polish.) Comparison of the Distribution of Time of Reaction in Some Continuously Working Apparatus in the Viscose Rayon Industry. **Porównanie rozrzutu czasów reakcji w niektórych aparatach przemysłu włókien wiskozowych przy pracy ciagłej.** W. Kiełbasiński and A Kaszyński. *Przemysł Chemiczny*, v. 13, May 1957, p. 249-256.

A theoretical approach to the problems of time distributions involved with the continuous operation of equipment used in fiber separation and cellulose treatment, including pulpers and mixers of various sizes.

17044* Carbonyl Groups in Cellulose and Colour Reversion. W. H. Rapson and K. A. Hakim. *Pulp and Paper Magazine of Canada*, v. 58, July 1957, p. 151-157.

Treatment of sulfite pulp with ClO_2 to give maximum brightness and then with sodium borohydride to reduce the carbonyl groups to hydroxyl groups gave a pulp with maximum brightness and maximum color stability. Hydrogen peroxide has a beneficial effect on color reversion but does not increase brightness as much as ClO_2.

17045* Investigations on Bating. III. The Mechanism of Bating. G. H. Green. *Society of Leather Trades' Chemists, Journal*, v. 41, July 1957, p. 222-248 + 4 plates.

Physical effects of bating of various types of pelts; influence of temperature and pH on bating; analysis of scud and bate liquors.

17046* Collagen and the More Soluble Constituents of Skin. J. H. Bowes, R. G. Elliott, and J. A. Moss. *Society of Leather Trades' Chemists, Journal*, v. 41, July 1957, p. 249-266.

Methods used for the determination of the amino acid composition and terminal amino groups of protein fractions; significance of the various soluble protein fractions in relation to the pretanning processes.

17047* The Estimation of Tannins in Black Wattle Barks and Commercial "Mimosa" Extracts. II. Statistical Comparison of the Official Hide-Powder (Shake) Method and Photometric Methods of Tannin Analysis. III. A Critical Examination of the Official Hide-Powder Method. D. G. Roux. *Society of Leather Trades' Chemists, Journal*, v. 41, Aug. 1957, p. 275-300.

17048* Instrumentation Studies. Determination of the Bonding Strength of Paper. V. Progress Report on the Development of a Prefilming Technique and on a Study of the Specimen Backing Material. W. A. Wink, W. M. Shillcox, and Roger H. Van Eperen. *Tappi*, v. 40, July 1957, p. 189A-199A.

17049* A Technique for Evaluation of Internal Additives, Pulps, and Refining Equipment. R. W. Davison, S. T. Putnam, R. T. Mashburn, and H. O. Ware. *Tappi*, v. 40, July 1957, p. 499-506.

Consists in separating the over-all effect into three parts: power substitution, fiber substitution, and property disproportionation values or those effects on sheet properties which are not accounted for by the power and fiber substitution values. Hercules Resin S139 is evaluated by this scheme.

17050* Factors Influencing the Oil and Resin Solution Penetration Rate, Absorbency, and the Resin Pickup of Absorbent Papers. Hanns F. Arledter. *Tappi*, v. 40, July 1957, p. 513-519.

17051* A New Apparatus and Procedure for Determining the Surface Receptivity and Roughness of Paper as These Relate to Liquid Film Applications. W. A. Wink and J. A. Van den Akker. *Tappi*, v. 40, July 1957, p. 528-536.

17052* The Effective Capillary Cross-Sectional Area of Wood as a Function of pH. John E. Stone. *Tappi*, v. 40, July 1957, p. 539-541.

A pH of 13.5 was necessary before the effective capillary cross-sectional area in the transverse directions rose to 80% of that in the longitudinal.

17053* Properties of Powdered Wood and Isolation of Lignin by Cellulytic Enzymes. John C. Pew. *Tappi*, v. 40, July 1957, p. 553-558.

17054* Alpha-Cellulose From Cotton Linters by a Low Temperature Process. Emerick J. Dobo and Kenneth A. Kobe. *Tappi*, v. 40, July 1957, p. 573-581.

Process temperature is below 180 F in all stages.

17055* Sugarcane Bagasse as a Fibrous Papermaking Material. S. B. Knapp, et al. *Tappi*, v. 40, Aug. 1957, p. 595-645.

An eight-part presentation of various aspects of utilization of this material. Bagasse pulping properties and procedures.

17056* Some Factors Affecting Ply Adhesion in Latex Saturated Papers. I. R. Dunlap. *Tappi*, v. 40, Aug. 1957, p. 676-680.

Test method for determining ply adhesion of saturated papers. Tentative explanation of the mechanism of adhesion, based on examination of thin sheet during drying of latex.

17057* A Hydrogen Bonding Mechanism for the Permanent Setting of Wool Fibers. A. J. Farnworth. *Textile Research Journal*, v. 27, Aug. 1957, p. 632-640.

A high degree of permanent set can be imparted in a short time at low temperatures by treatment of extended fibers with a solution of urea containing a reducing agent. The results are readily explained by breakdown and reformation of hydrogen bonds following scission of some cystine linkages.

17058* An Appraisal of Shrink-Resistant Treatments for Wool. Arnold M. Sookne. *Textile Research Journal*, v. 27, Aug. 1957, p. 652-661.

A review of the mechanisms by which wool shrinks, and several classes of treatment available for making shrink-resistant wool. A number of low cost, adequate shrink-resistant processes are currently available, and wool requires shrink resistance in order to compete with man-made fibers in end uses requiring ease-of-care.

See also: **16981** (polyethylene coated papers); **16988** (treatment of textile wastes).

WELDING AND JOINING

17059 The Brazing of Aluminium and Its Alloys. *Aluminium Development Association, Information Bulletin No.* 22, June 1957, 36 p. (TS550 AL82i Vis.)

An information bulletin on the main methods, flame, furnace, and flux-dip brazing.

17060* (Russian.) Arc-Welding in a Gas Atmosphere and Its Field of Application. **Gazoelektricheskaia svarka i ratsional'nye oblasti ee primeneniia.** B. E. Paton. *Avtomaticheskaia Svarka*, v. 10, May-June 1957, p. 1-8.

Suggests welding Al, Ti, Al-Ti alloys, Mo, Zr, and certain high alloyed material of less than 2 to 4 mm. cross-section in an argon atmosphere. A CO_2-atmosphere is applied in cases of high-alloyed steel of small cross-section.

17061* (Russian.) Automatic Welding of Thin Steel in CO_2 Atmosphere. **Avtomaticheskaia svarka tonkoi stali v srede uglekislogo gaza.** I. I. Zaruba and A. G. Potap'evskii. *Avtomaticheskaia Svarka*, v. 10, May-June 1957, p. 22-27.

Gives chemical composition, method of welding in CO_2 atmosphere, and welding rod types for two steels.

17062* (Russian.) Automatic Welding of Low-Alloy High Quality Steel in CO_2 Atmosphere. **Avtomaticheskaia svarka nizkolegirovannykh stalei povyshennoi prochnosti v srede**

uglekislogo gaza. B. S. Kasatkin, N. I. Kakhovskii, and Iu. N. Vakhnin. *Avtomaticheskaia Svarka,* v. 10, May-June 1957, p. 39-43.

Method of welding low-alloy steels in CO_2-atmosphere. Specifications of the steels and rod used.

17063* (Russian.) Welding Rod for Beading of Wear-Resistant Steel in CO_2-Atmosphere. **Provoloka dlia naplavki iznosostoikikh stalei v srede uglekislogo gaza.** I. K. Pokhodnia. *Avtomaticheskaia Svarka,* v. 10, May-June 1957, p. 51-54.

Experimental investigation toward improvement of the electrode material by introducing Ti into the rod. Chemical compositions.

17064* (Russian.) Certain Problems in Titanium Electro-Slag Welding. **Nekotorye voprosy elektroshlakovoi svarki titana.** S. M. Gurevich and V. P. Didkovskii. *Avtomaticheskaia Svarka,* v. 10, May-June 1957, p. 85-91.

Electro-slag welding of large-section Ti structures under an argon atmosphere.

17065* The Metallurgy of Welding Aluminium and Its Alloys. W. I. Pumphrey and E. G. West. *British Welding Journal,* v. 4, July 1957, p. 297-306.

A summary of the metallurgical principles involved.

17066* The Metallurgical Background to Magnesium Alloy Welding. E. F. Emley. *British Welding Journal,* v. 4, July 1957, p. 307-321.

Fusion weldability; characteriticss of various welding methods; flux entrapment problems in gas welding; special difficulties in attempting to gas weld the alloys containing Zr.

17067* A Consideration of the Factors Affecting Porosity in Self-Adjusting Metal-Arc Welds on Mild Steel. A. R. Muir. *British Welding Journal,* v. 4, July 1957, p. 323-335.

17068 Properties of Welds Made Under Argon and Carbon Dioxide. E. M. Eskin, E. P. Pogozhkin, and N. M. Novoshilov. *Henry Brutcher Translation No.* 3947, 12 p. (From *Svarochnoe Proizvodstvo,* no. 1, Jan. 1957, p. 15-17.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 7817, v. 6, May 1957.

17069* (Spanish.) Multiple Spot Welding for Rapid Production. **Metodos de soldeo por puntos multiples para produccion a gran velocidad.** H. W. Roth. *Ciencia y Técnica de la Soldadura,* v. 7, May-June 1957, 6 p.

Advantages and disadvantages of three welding methods: hydromatic, high speed pressure, and multiple transformer methods for rapid production of plate and wire products.

17070* Mechanized Soldering of Printed Circuit Boards. Ted Gates and J. Gogan. *Electrical Manufacturing,* v. 60, Aug. 1957, p. 147-149.

Control of depth of immersion and dwell time obtainable over hand methods are advantages of two commercial types of machines, one using a motorized plunger action, the other employing a stationary wave of solder pumped clean from bottom of bath. Some precautions are given to prevent filling holes.

17071 Soldering: Automation Breeds New Problems. H. J. McGarvey and G. P. McKnight. *Iron Age,* v. 180, Aug. 15, 1957, p. 104-105.

Time for soldering small electronic parts by automatic batch dipping is increased over hand methods. Corrective measures are recommended to avoid damage to sensitive parts by overheating.

17072* What It Takes to Weld Aluminum. I. *Marine Engineering,* v. 62, Sept. 1957, p. 111 + 5 pages.

Lack of knowledge is being overcome to promote greater use of Al. (To be continued.)

17073 How Glue Sticks. Norman A. de Bruyne. *Nature,* v. 180, Aug. 10, 1957, p. 262-266.

A diseussion of the interfacial forces of various materials.

17074* (Russian.) Investigation of Overdistribution of Chromium in Welding of Stainless Steel by Method of Radioactive Tracers. **Issledovanie metodom radioaktivnykh indikatorov pereraspredeleniia khroma pri svarke nerzhaveiushchei stali.** B. I. Bruk. *Svarochnoe Proizvodstvo,* 1957, no. 7, July, p. 1-4.

Theoretical and experimental data on method of radioactively determining coefficients of Cr transformation from base metal, electrode wire and coating using the radioactive isotope Cr^{51}. The distribution of Cr between weld metal and slag in welding of stainless steel is calculated.

17075* (Russian.) Improvement of Weld Joint Metal Quality. **Povyshenie kachestva metalla svarnykh shvov.** A. A. Alov and V. S. Vinogradov. *Svarochnoe Proizvodstvo,* 1957, no. 7, July, p. 9-10.

Increasing weld joint resilience by welding with vibrating electrode. Hypothesis of increasing other properties of weld metal, in particular of distribution of nonmetallic inclusions and joint sensitivity to cracking, by decreasing size of primary grain.

17076* (Russian.) Method of an Approximate Calculation of Electrical Parameters for Electric Slag Welding Operation. **Metodika priblizhennogo rascheta elektricheskikh parametrov rezhima elektroshlakovoi svarki.** I. L. Brinberg. *Svarchnoe Proizvodstvo,* 1957, no. 7, p. 10-13.

A method for preliminary calculation of electric parameters which considerably shortens the time and decreases the amount of work required for preparation of welding procedure and makes many test specimens unnecessary. Foundations of approximate calculation of welding procedure, calculated formulas and diagrams.

17077* (Russian.) Magnetographic Tests of Weld Joints. **Magnitograficheskii kontrol' svarnykh soedinenii.** A. S. Fal'kevich, Iu. V. Usenko, and V. M. Lubov. *Svarochnoe Proizvodstvo,* 1957, no. 7, July, p. 20-22.

Main characteristics of the magnetographic test, its advantages and disadvantages. Two schemes of magnetization are recommended: 1) transverse magnetization by means of discelectromagnet, DM-4, and 2) impulsive magnetization of pipe joints.

17078* (Russian.) Formation of Slag Inclusions in Pool-Slag Welding. **O mekhanizme "zashlakovki" pri vannoi svarke.** A. Ia. Brodskii. *Svarochnoe Proizvodstvo,* 1957, no. 7, July, p. 22-24.

Describes several experiments in pool welding to study frequent slag inclusions. Results of experiments indicate that main cause of formation is intensive absorption of heat by welded members increasing with growing diameter of members. As means of remedy, preheating of welded members, or cooling of mold is proposed.

17079* (German.) Progress in Welding With Austenitic Materials in the Construction of Equipment and Containers. **Fortschritte bei Schweissungen mit austenitischen Werkstoffen im Apparate- und Behälterbau.** J. Mundt. *Technische Mitteilungen Krupp,* v. 15, June 1957, p. 29-36.

Possibilities for improving ductility of austenitic welds.

17080* (German.) Some Factors Which Can Influence the Quality of Pure Weld Material. **Über einige Faktoren, die die Gütewerte von reinem Schweissgut beeinflussen können.** H. Sachs. *Technische Mitteilungen Krupp,* v. 15, June 1957, p. 37-46.

Influence of weld temperature and shape, electrode operation, and H content.

17081* Basic Factors in Brazing Alloy Selection and Joint Design. Lester F. Spencer. *Tooling and Production,* v. 23, Aug. 1957, p. 93-97.

17082 A New Concept of Welded Design for Improved Vibration Control. Omer Blodgett. *Welding Journal,* v. 36, Aug. 1957, p. 779-785.

Some new ideas about vibration and its control through the use of welded steel which have come out of recent research.

17083 Automatic Inert-Gas-Shielded Tungsten-Arc Welding of Aluminum Alloys. H. D. Mann and R. E. Purkhiser. *Welding Journal*, v. 36, Aug. 1957, p. 790-797.

Describes successful use of a.c. with existing automatic inert-gas-shielded-tungsten-arc equipment.

17084 Ni-Cr-B Brazing of a High-Temperature Alloy. George Aggen, Roger A. Long, and Edward E. Reynolds. *Welding Journal*, v. 36, Aug. 1957, p. 366s-372s.

A brazing investigation was conducted on sheet and bar specimens of A-286, an iron-base precipitation-hardening high-temperature alloy. A Ni-Cr-B brazing alloy meeting AMS-4775 specifications was used in joining all the specimens. The paper includes descriptions of the brazing furnace and brazing cycles required to obtain optimum joints in the specimens and the simple and inexpensive surface preparation that was utilized. The quality of the brazed joints was evaluated by metallographic examinations and mechanical tests. These tests include smooth- and notched-bar rupture tests at 1200 F and short-time tensile tests at room temperature, 1200, and 1300 F. Metallographic examinations were also made in order to determine the effects of the brazing alloy and the brazing time-temperature cycles upon the microstructure of the high-temperature alloy. These were correlated with the results obtained from the mechanical tests. Three types of specimens were evaluated by mechanical tests and metallographic examinations: surface-brazed specimens, butt-brazed bar specimens and double-lap sheet specimens. The results of the investigation indicate that the brazing time-temperature cycle somewhat impairs the 1200 F rupture properties of the high-temperature alloy, but that these properties can be largely recovered by proper post-brazing heat treatment. Microstructural changes introduced at the surfaces of the base metal by the brazing alloy were shown to result in superior elevated-temperature properties. The strengths of the brazed joints were satisfactory, but not as high as those of the base A-286 alloy.

17085 Studies of Welding Arcs Using Various Atmospheres and Power Supplies. T. B. Hazlett and G. M. Gordon. *Welding Journal*, v. 36, Aug. 1957, p. 382s-386s.

Results of preliminary survey of the variables connected with the consumable-electrode gas-shielded welding of steel.

17086 Developments in the Argonarc Spot Welding Process. J. L. Steer and F. W. Copleston. *Welding and Metal Fabrication*, v. 25, Aug. 1957, p. 282-288.

A tungsten arc spot welding process for joining light gage materials from one side only.

See also: **15662** (glass-to-metal bonding); **16095** (joining Al); **16448** (sandwich structure loading); **16501** (welding atmosphere and corrosion resistance of Zircaloy -2 and -3); **16506** (corrosion of stainless-steel welds); **16576** (normalization of welds); **16597** (fatigue and design in welded naval construction); **16611** (static strength of welded joints); **16667** (planished weld costs); **16946** (hot gas welding of plastics).

MISCELLANEOUS

17087* The Study of Variability in Engineering Design. S. James Morrison. *Applied Statistics*, v. 6, June 1957, p. 133-138.

Shows how a fairly straightforward application of statistical theory can help the designer. A rough prediction of the variability of a product can be made, and the elements in the design that to give the most trouble can often be identified.

17088 Body Geometry Data. R. H. Warring. *Design News*, v. 12, Aug. 15, 1957, p. 106-111.

Human fatigue can be minimized by proportioning working conditions to the basic body geometry of the operator.

17089 Mechanics of High Speed Projectile Perforation. Melvin Zaid and Burton Paul. *Franklin Institute, Journal*, v. 264, Aug. 1957, p. 117-126.

The problem of perforation of thin plates by high speed projectiles is considered from a momentum viewpoint. Equations representing the magnitude and direction of forces, velocity, etc. as a function of penetration distance are derived for a conical projectile under normal impact.

17090 German Rearmament and Atomic War. Hans Speier. 272 p. 1957. Row, Peterson and Co., Evanston. (UA710 Sp32g)

Analyses the views of German military and political leaders on current international affairs, prospects and shape of war in the future, and German rearmament.

17091 On Human Communication. Colin Cherry. 333 p. 1957. Massachusetts Institute of Technology, Cambridge, Mass. (P3 C42o)

A series of essays concerning the growth of modern interest in the relationships existing between such communication sciences as linguistics, mathematics, cybernetics, psychology, semantics, and phonetics.

17092* (French.) Industrial Research in France. Documentation Concerning the Principal Research Centers, 1954-1955. **La recherche industrielle en France. Documentation sur les principaux organismes de recherches, 1954-1955.** 185 p. Department of Industry and Commerce, Paris. (T177.F8 F84r Ref.)

A book of information concerning the structure of industrial research in France. Changes in the management and organization during 1954-1955. New centers. Industrial property.

17093* Precise Measurements of Distance by Microwaves. I. Rolt Hammond. *Instrument Practice*, v. 11, Aug. 1957, p. 828-831.

Triangulation base lines from 500 ft. to 35 mi. can be measured by "Tellurometer" equipment with an accuracy of 1 part in 300,000. (To be continued.)

17094* Measures of the Efficiency of Acceptance Sampling Plans. Tee H. Hiett, Jr. and Don S. Holmes. *Journal of Industrial Engineering*, v. 8, July-Aug. 1957, p. 209-214.

A comparison of sampling techniques.

17095 Fitting Equations by Method of Least Squares. Charles I. Tiplitz. *Machine Design*, v. 29, Aug. 8, 1957, p. 108-111.

Basic principles for applying the method of least squares to finding the best equation to fit empirical curves and data.

17096 Stop Foundry Accidents. *Modern Castings*, v. 32, Sept. 1957, p. 35-46.

Series of articles discussing safety procedures, safety devices, and specific examples for eliminating hazards.

17097 Northern Rhodesia Chamber of Mines Year Book 1956. 126 p. 1957. Chamber of Mines, Kitwe, Northern Rhodesia. (TN447 N81r)

Statistical and company information on Northern Rhodesia Cu mines.

17098 Property Changes of Emulsion Floor Polishes. Robert Rosenbaum, Ralph Bock, and Robert E. Clark. *Soap and Chemical Specialties*, v. 33, Aug. 1957, p. 83 + 4 pages.

Study of property changes imparted to industrial and household emulsion polishes by the addition of low molecular weight emulsifiable polyethylene.

17099 The Story of Archaeology. Agnes Allen. 245 p. 1956. Faber and Faber, London. (CC165 A153s)

Details of the major archaeological discoveries.

17100 The Iterative Solution of Elliptic Difference Equations. Bernard Friedman. *U. S. Atomic Energy Commission, Research and Development Report*, NYO-7698, June 1957, 37 p. (UF767 U3ny Contin.)

For a certain class of iteration schemes, it is proved that the method of successive point displacements converges twice as fast as the method of simultaneous point displacements. It is also proved that for such schemes the rate of convergence is unaltered by changes in order in which the iteration is done.

17101 The Comparative Response of Dogs to 250 KVP and 100 KVP X-Rays. E. L. Alpen, D. M. Jones, H. H. Hechter, and V. P. Bond. *U. S. Naval Radiological Defense Laboratory, Research and Development Technical Report*, USNRDL-TR-142, Jan. 1957, 30 p. (QC475 Un3.5r Contin.)

The LD_{50} is 280 r for 250 KVP and 664 r for 100 KVP measured in air. Various methods of correcting this dose to explain the differences in effectiveness are described.

See also: **15699** (explosives factory safety); **16215** (tables of $(\sin x)/x$); **16529** (safety in the use of oxygen in refining pig iron); **16777** (nuclear safety in reprocessing plants).